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COLOR VARIATION IN EASTERN NORTH AMERICAN FLOWERS AS EXEMPLIFIED BY *HEPATICA ACUTILOBA*

EDGAR ANDERSON

THE study of color variation in *Hepatica acutiloba* was undertaken because this species presents marked variation in color and can often be collected in sufficient numbers to give reliable averages. A preliminary report¹ presented data from plants studied along the Narrows of the Big River near Eureka, Missouri. Dr. Ledyard Stebbins very kindly made a census of 191 plants from a maple woods near Hamilton, New York and I personally was able to study 42 plants in a rocky, hardwood forest at Fairlee, Vermont. As in the first communication on the subject, two characters were recorded for each plant, sepal number and flower color.

SEPAL NUMBER. The plants from New York and Vermont had very slightly higher averages for sepal number (7.3 and 6.9 respectively) than did those from Missouri (6.2). Aside from this slight difference in averages, the three collections were remarkably similar in so far as sepal number was concerned. FIGURE 1 demonstrates the similarity of the frequency distributions for the three localities.

FLOWER COLOR. Flower color presented a very different picture from sepal number. There was a pronounced gradient in color and color intensity between Missouri and Vermont, the latter region having a strong tendency to whites and very pale-colored flowers, the former to brighter, stronger colors. Flowers are scored as whites, pinks, and blues. With a little practice this can be done quite reliably. The true whites have no trace of pink or blue in the bud; they have at most a cream or yellowish-green tone. The pinks are sometimes diffi-

¹ Anderson, Edgar. RHODORA 35: 66-67. 1933.

cult if not impossible to distinguish from the whites, when the flowers have opened, but in the bud there is a pronounced flush of pink particularly at the bases and edges of the sepals. Blues and pinks are very easily separated aside from an occasional magenta-flowered plant. These magentas (two or three in all) have been scored with the pinks. The scoring for deepness of color is unfortunately not quite as objective, three classes being recognized, "very faint," "faint," and "deep." Into the first go those flowers which show color only in the bud, being

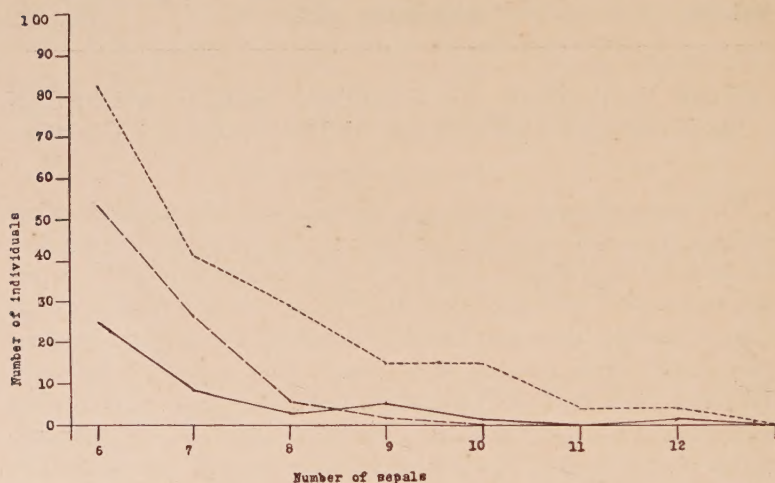


FIG. 1. Variation in Number of Sepals in *Hepatica acutiloba* from Hamilton, New York (dotted line); Eureka, Missouri (dashes); and Fairlee, Vermont (solid line).

practically white when full blown. The division into the remaining two classes is purely subjective.

The data for the three localities are presented in TABLE 1. The actual figures are given as well as percentages, the latter being in brackets. The general geographical trend in flower color from the Ozarks to New England is plainly shown. The percentages of blue, of white and of faint-colored all demonstrate the same tendency. Blue, which in Missouri makes up over a third of the population, falls to less than an eighth in Vermont. White, which, on the other hand, is altogether lacking in Missouri, represents one-sixth of the New York collection and over a third of that from Vermont. The same general tendency is demonstrated, though less objectively, when the figures for percentages of faint color are examined.

NARROWS OF THE BIG RIVER, MISSOURI

	very faint	faint	deep	total
pink	16	24	8	48 [65]
blue	0	13	13	26 [35]
white	0	0	0	0
total	16 [21.6]	37 [50]	21 [28.4]	74

HAMILTON, NEW YORK

	very faint	faint	deep	total
pink	40	49	14	103 [54]
blue	10	23	18	51 [26.7]
white	37	0	0	37 [19.3]
total	87 [45.6]	72 [37.7]	32 [16.7]	191

FAIRLEE, VERMONT

	very faint	faint	deep	total
pink	15	7	0	22 [52.4]
blue	0	4	1	5 [11.9]
white	15	0	0	15 [35.7]
total	30 [71.4]	11 [26.2]	1 [2.4]	42

TABLE 1. Variation in flower color of *HEPATICA ACUTILOBA* from three localities. Figures in brackets are percentages.

The figures for these three collections, therefore, demonstrate a geographical gradient in color between the Green Mountains and the Ozarks for *Hepatica acutiloba*. While further study will be necessary to confirm these results, partial confirmation can be found in the opinions of naturalists familiar with the vernal flora of the two regions. In the opinion of several such naturalists, the results reported above are indicative of a general relationship. The greater brilliance of the spring flora of the Ozarks is not entirely a matter of different species. In several instances, at least, when the same species appears in the spring flora of the two regions, the Ozark form is brighter in color. *Viola pedata* is commonly represented in New England only by the self-colored variety, *Viola pedata* var. *lineariloba*. In the Ozarks the much more brilliant bicolored flowers of the type are found accompanying the self-colored ones of the variety. The flowers of Dutchman's Breeches, *Dicentra Cucullaria* (L.) Bernh., as seen in New England, are usually white or cream-colored. In the Ozarks they are suffused with pink.

Within New England itself there is a tendency towards a greater frequency of white and pale-flowered forms as one approaches the White Mountains. *Cypripedium acaule* Ait., for instance, is bright

pink to pale pink in southern New England but in the neighborhood of the White Mountains *Cypripedium acaule* Ait. f. *albiflorum* Rand & Redfield becomes so common as actually to replace it in certain areas.¹

For the paler colors found in *Hepatica acutiloba* and in other species in New England as compared with the Ozarks, and for the greater frequencies of albinos in the vicinity of the White Mountains, one might offer two quite different explanations. Both depend upon the fact that the New England forests are denser and shadier than the upland forests of the Ozarks and that within New England they become progressively shadier towards the mountains, culminating in the deep shade of the spruce forests of that region. By the first explanation the paler-flowered forms would be the direct result of generations of existence within this shady environment. Though such an explanation might immediately be advanced by many naturalists, it finds little support in experimental biology. An explanation more fully in accord with the facts of variation and heredity is that in this case, as in many others, the environment affects the organism indirectly by selection. In the deep woods, as at dusk, white flowers are more conspicuous than colored ones. In the full blaze of the sun they are less so. Selection, therefore, operates differently in the two environments, and from the same basic stocks produces bright-flowered races in the sunny Ozark woodlands and white-flowered and pale-tinted ones in the shadier New England forests.

MISSOURI BOTANICAL GARDEN.

ASPLENIUM PLATYNEURON (L.) OAKES, var. **bacculum-rubrum** (Featherman),—comb. nov. *A. ebeneum*, var. *Bacculum Rubrum* Featherman, Rep. Bot. Surv. So. Centr. La. 1870: 75 (1871). *A. platyneuron*, var. *euroaustrinum* Fernald in RHODORA, xxxvii. 382, pl. 384, figs. 1 and 2 (1935).

Mr. Weatherby unkindly calls my attention to the publication of the variety of Americus Featherman, whose plant (as the name was intended to indicate) came from near Baton Rouge. There seems to be no question that Featherman had the large extreme with discrete sori described by me.—M. L. FERNALD.

¹ Pease, A. S. Proc. Bost. Soc. Nat. Hist. 37: 216. 1924.

STUDIES IN THE TAXONOMY AND DISTRIBUTION OF THE EASTERN NORTH AMERICAN SPECIES OF LOBELIA

ROGERS McVAUGH

(Continued from page 298)

9. *L. SPICATA* Lamarek, Dict. Bot. III: 587. 1789. This is a species with at least five well-defined phases, which may be distinguished as follows:

a) Var. *LEPTOSTACHYS* (A. DeCandolle) Mackenzie & Bush, Fl. Jackson County, Mo. 183. 1902.—TYPE LOCALITY: "in Carolina merid." TYPE SPECIMEN: The plant described by DeCandolle as *L. leptostachys* was seen by him in the herbarium of Asa Gray, collected by Fraser. This has not been seen, but there is in the New York Botanical Garden a specimen collected at Lincolnton, N. C., by the Rev. M. A. Curtis, which was verified by Asa Gray, and is also marked "*Lob. leptostachys* A.DC. Genève 1839."—*L. leptostachys* A. DeCandolle, Prodr. Syst. Veg. VII: 376. 1839. *L. bracteata* Small, Fl. S.E.U.S. 1146. 1903.—Stem strict, unbranched, 30–120 cm. high, dark purplish-red and densely short-pubescent near the base, becoming smooth and light green above; often pubescent on the angles formed below the decurrent leaf-bases. Cauline leaves 10–40, usually quite close together and somewhat appressed to the stem, thus giving them an imbricated appearance in dried material; firm or leathery in texture; sessile, or the lowest narrowed to short petioles; the lower and middle ones obtuse, long-oblong or oblanceolate, to 2.5×12 cm., appearing sub-entire, but beset with callose-glandular teeth along the margins. Upper leaves gradually smaller, becoming definitely bract-like (lance-acute), and merging into the bracts of the inflorescence. Basal leaves usually few or none; if present, oblanceolate, obtuse. All leaves strigose-pubescent above and below, especially the lower

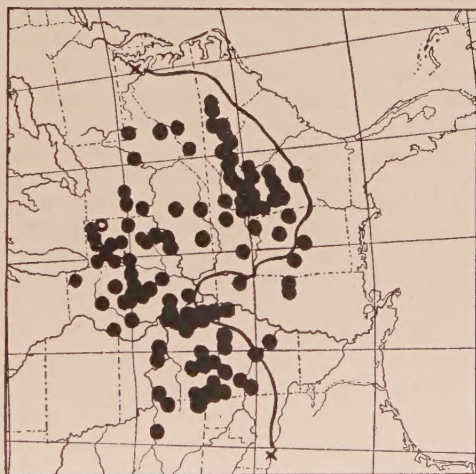


FIG. 14. Range of *LOBELIA SPICATA*, var. *LEPTOSTACHYS*.

leaves and near the margins. Plants, when dried, often with a characteristic brownish-green color. Inflorescence a terminal virgate spike 20–30 (50) cm. long, densely flowered, not noticeably secund, bearing 20–200 (ave. 30–60) flowers upon very short (in fruit 2–4 mm.) rough-puberulent curved pedicels, each with a pair of inconspicuous bracteoles near the base. Flower-bracts ciliate-pubescent or sometimes smooth, lanceolate, acute, sometimes linear-lanceolate, usually conspicuous, 1–4 cm. long. Calyx in anthesis flattish or conic, smooth or pubescent, becoming hemispheric in fruit, strongly ribbed, about 3.5 mm. in diameter. Capsule $\frac{1}{2}$ – $\frac{2}{3}$ inferior. Calyx-lobes subulate or linear-lanceolate, (2) 3–6 (7) mm. long, bristly-ciliate especially near the tips, or smooth; auricles at the base of each lobe filiform, 1–3 (5) mm. long, deflexed. Flower 9–12 mm. long, including calyx. Corolla light blue, smooth or pubescent outside, the lower lip pubescent at the base inside. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip ovate, not sharply reflexed, slightly shorter than the tube; two upper lobes lanceolate, curved upward. Filament-tube 3.0–3.5 mm. long, pubescent below, connate above about half its length. Anther-tube 1.8–2.0 mm. long, light bluish-gray, the two smaller anthers each with a tuft of white hairs at the tip, the three larger usually pubescent on the backs.

While this plant in its most characteristic state seems wholly distinct from var. *originalis* and var. *hirtella*, it is separated from them by no constant characters, and where the ranges of any of the three overlap, puzzling intermediates are frequently encountered. "Typical" var. *leptostachys* differs from var. *originalis* by the longer auricles, shorter pedicels (and consequently narrower spikes), somewhat longer, denser inflorescences, longer bracts, leaves thicker, longer, more numerous, more nearly entire, more appressed; somewhat heavier pubescence. It differs by similar characters from the pubescent var. *hirtella*. However, many specimens from Illinois, Missouri, Iowa, can be referred to no one of the three; all the distinguishing characters break down. In consequence, it seems best to consider all three as varieties of the same species (See FIG. 19).

Dry sandy woods and hillsides, northern West Virginia to central Alabama, west to northern Illinois, eastern Kansas and western Arkansas. Rare or absent on the eastern Coastal Plain; occasional on the Gulf Coastal Plain in Alabama, Mississippi, Arkansas and western Tennessee. Flower June 20–August 1. Representative Material seen: VIRGINIA: MONTGOMERY: *Leidy*, Jy. 1867 (ANS, UP). SMYTH: Chilhowie, *Small*, Aug. 1892 (NB). WEST VIRGINIA: GREENBRIER: Lewisburg, *Gray* 282 (CM). MONONGALIA: "Morgantown, Va.," *Dr. Paddock*, Short herb. (W). WOOD: Leachtown, *Millsbaugh* 304 (NB, WV). NORTH CAROLINA: BUNCOMBE: Biltmore, *Biltmore herb.* 625b (G, M, Mo, NB, UP, US, W). CALDWELL: Hudson, *Randolph* 1131 (G). CHEROKEE: Andrews, *Huger*, Sep. 1900 (NB). DURHAM: Durham, *Blomquist* 5023 (Duke). FORSYTH: Winston-

Salem, *Schallert*, Jy. 1911 (Duke). HAYWOOD: *Ashe*, Sep. 1893 (NC). IREDELL: Statesville, *Hyams* (M). LINCOLN: Lincolnton, *Curtis* (ANS, NB). ORANGE: Hillsborough, *M. A. Curtis* ? (G). POLK: Columbus, *Townsend*, Oct. 1897 (US). ROWAN: Salisbury, *Heller* 108, Jun. 28, 1890 (ANS, Mo, NB). SWAIN: Great Smoky Mts., *Hemingway*, Aug. 1891 (WVa). SOUTH CAROLINA: PICKENS: nr. Clemson College, *House* 2957 (US). GEORGIA: BALDWIN: "Georgia, *Dr. Boykin*," Torrey herb. (NB). CLARKE: Princeton, *Miller and Maguire* 1489 (CU). CLAYTON: dry woods, *Harper* 230 (G, Mo, US). COBB: *Wilson* 33 (G, Mo, US). DEKALB: Stone Mt., *Eggert*, Jy. 1897 (Mo). FANNIN: Blue Ridge Mts., *H. H. Smith* 2533 (W). FLOYD: W. Rome, *Pennell* 4079 (UP, NB). GWINNETT: McGuire's Mill, *Small*, Jy. 1893 (Mo, US). HABERSHAM: Clarkesville, *J. D. Smith*, Sep. 1883 (G, US). WALKER: Lookout Mt. (no Co. given), *Ruth*, Jy. 1898 (Mo, NB, US). ALABAMA: AUTAUGA: Prattville, *Mohr*, Jy. 1880 (US). BLOUNT: *Mohr*, Jun. 1883 (US). CLAY: Millerville, *Pollard and Mazon* 169 (NB). JACKSON: Scottsboro, *Earle*, Jun. 1899 (NB). TALLADEGA: Riddell's Mill, *Mohr* (US). TUSCALOOSA: Tuscaloosa, *Mohr*, Oct. 1879 (US). MISSISSIPPI: LOWNDES: Mayhew, *Donald*, Jun. 1927 (W). OKTIBBEHA: Starkville, *Phares*, ann. 1883 (Miss). KENTUCKY: FAYETTE: Lexington, *C. W. Short*, ann. 1836 (NB). PULASKI: Burnside, *Pennell* 13795 (ANS). WARREN: Bowling Green, *Price*, Jun. 1897 (Mo). TENNESSEE: BRADLEY: Cleveland, *Leeds*, Jun. 1929 (ANS). CHESTER: Henderson, *Bain* 214 (NB). COFFEE: Tullahoma, *Gattinger*, Jy. 1880 (Del). CUMBERLAND: Daysville, *Anderson* 1401 (G). HAMILTON: Lookout Mt., *Vasey*, ann. 1878 (ANS, US). KNOX: Knoxville, *Ruth*, Jy. 1895 (ANS, M. W). OHIO: CLARK: Springfield, *Williams* (Mo). HAMILTON: Cincinnati, *Lea* (ANS, NB). MONTGOMERY: Dayton, *Morgan*, Jy. 1879 (NB, US). INDIANA: BENTON: Barce, *Deam* 11857 (CCD). BROWN: Belmont, *Deam* 43459A (CCD). CASS: Cicott, *Deam* 25899 (ANS). FOUNTAIN: Fountain, *Deam* 25819 (CCD). HARRISON: Elisabeth, *Deam* 20529 (CCD). HENRY: Springport, *Deam* 45344 (CCD). KOSCIUSKO: Winona Lake, *Deam* 422 (CCD). LAWRENCE: Mitchel, *Deam* 17263 (CCD). MARSHALL: Culver, *Deam* 9017 (CCD). NEWTON: Thayer, *Deam* 50607 (CCD). NOBLE: Albion, *Deam* 20751 (NB). PERRY: Derby, *Deam* 11534 (CCD). TIPTON: Kempton to Goldsmith, *Deam* 13630 (CCD). WASHINGTON: Campbellsburg, *Deam* 37154 (CCD). WHITE: Burnettsville, *Deam* 39340 (ANS). ILLINOIS: CASS: Beardstown, *Geyer*, Jy. 1842 (ANS, G, Mo, NB, W). CHAMPAIGN: *Raymond*, Jy. 1869 (W). CHRISTIAN: Taylorville, *Andrews*, Aug. 1898 (CU). HANCOCK: Augusta, *Mead*, Jy. 1847 (NB). LOGAN: Lincoln, *Mills*, Jy. 1899 (G). MC LEAN: Hendrix, *Robinson*, Aug. 1904 (G). MASON: Havana, *Gleason*, Aug. 1903 (G). MENARD: Athens, *Hall*, ann. 1861 (G, US). PEORIA: Peoria, *Brendel* (NYS). ST. CLAIR: French Village, *Eggert*, Jy. 1886 (Mo). SHELBY: Windsor, *Gleason* 748 (G). UNION: Cobden, *F.S.E.*, Jun. 1879 (CM). MISSOURI: "upper Missouri," *Geyer*, ann.

1835 (Mo). BARRY: Eagle Rock, *Bush* 113 (G, Mo, NB, US). BOONE: W. Webster, *Drunshel* (?) 1788 (Mo). BUTLER: Poplar Bluff, *Eby*, Jy. 1893 (Mo). CALLAWAY: McCredie, *Schwab*, Jy. 1924 (UP). DENT: Rhyse, *Kellogg* 15309 (Mo). DUNKLIN: Pine City, *Bush* 433 (Del, Mo). FRANKLIN: Gray Summit, *Kellogg* 1212 (Mo). GREENE: Springfield, *Dewart* 30 (Mo). IRON: Hogan, *Russell*, Jy. 1898 (Mo). JASPER: Webb City, *Palmer* 924 (Mo). JEFFERSON: Kimmswick, *Engelmann*, Aug. 1866 (Mo). MC DONALD: *Bush*, Jy. 1893 (Mo). MADISON: Mine La Motte, *Eggert*, Jun. 1898 (Mo). NEWTON: Neosha, *Wilkins* 2512 (ANS). PHELPS: Jerome, *Kellogg*, Jy. 1912 (Mo). ST. LOUIS: St. Louis, open woods, *Engelmann*, Jy. 1842 (Mo). SHANNON: Montier, *Bush* 6128 (Mo). TANEY: Swan, *Bush* 3437 (G, Mo). WASHINGTON: Irondale, *Glatfelter herb.*, Aug. 1895 (Mo). WEBSTER: Marshfield, *Partridge*, Jy. 1908 (W). WRIGHT: Mansfield, *Palmer* 6240 (Mo). ARKANSAS: BAXTER: Cotter, *Palmer* 5964 (Mo). BENTON: *Plank*, ann. 1899 (in part) (NB). CARROLL: Eureka Springs, *Palmer* 4407 (Mo). FRANKLIN: Ozark, *Palmer* 8148 (Mo, NB). FULTON: Mammoth Spring, *Demaree* 5273 (US). JEFFERSON: Jefferson Springs, *Pennell* 10668 (ANS). PULASKI: Little Rock, *Coville* 64 (US). SEBASTIAN: Fort Smith, *Bigelow*, ann. 1853-4 (US). WASHINGTON: Fayetteville, *Harvey* 54 (ANS, CM, M, Mo). KANSAS: CHEROKEE: *Hitchcock* 752 (G, Mo, NB, R, US). MIAMI: Paola, *Oyster*, Aug. 1879 (Mo).

b) Var. **originalis**. TYPE LOCALITY of *L. spicata* Lamarck: Canada. TYPE SPECIMEN: In the Museum National d'Histoire Naturelle in Paris; the following description of it was furnished by Professor F. Gagnepain: "Anthères pales, à peine plus colorées (bleuâtres) que les filets. Sépales longs de 3.5-4 mm., complètement glabres, sans aucun cil, à oreillettes nulles. Calice égalant moitié du bouton à la veille de l'anthèse, dressé, puis un peu étalé à l'épanouissement de la fleur." (FIG. 25).—Not *Rapuntium foliis oblongis villosis* of the "Flora Virginica," as stated by DeCandolle (Prodr. VII: 374). This is probably *L. puberula* Mx.; Gronovius (1762) states that this plant (*Clayton n. 669*) flowers in September, which seems to rule out *L. spicata*. *L. spicata* Lamarck, Dict. Bot. III: 587. 1789. *L. Claytoniana* Michaux, Fl. Bor. Am. II: 153. 1803. Michaux also states that this is a synonym for Clayton's plant mentioned above. *L. goodenioides* Willdenow, Hort. Berol. I: plate 30. 1806. *L. pallida* Muhlenberg, Cat. Pl. Am. Sept. 22. 1813. Muhlenberg gives this name as a synonym for *L. goodenioides* Willd., but the material in the Muhlenberg herbarium, at the Academy of Natural Sciences of Philadelphia, is in such poor condition that it is impossible to determine the identity of *L. pallida*. *L. nivea* Rafinesque, Annals of Nature I: 15. 1820. *L. spicata* var. *parviflora* Gray, Syn. Fl. 6. 1878.—Stem strict, unbranched (rarely a few slender upright axillary branches bearing a few flowers), 20-110 cm. high, dark purplish-red and densely short-pubescent near the base, becoming smooth and light green above, made angular by the decurrent leaf-bases. Cauline leaves

3–20, usually not appressed to the stem, thin, sessile, or the lower narrowed into short margined petioles; the lower obtuse, oblanceolate, oblong or obovate, as large as 2.5×10 cm., shallowly coarse-dentate or sub-entire. Upper leaves gradually smaller, acute-lanceolate, often becoming more conspicuously denticulate above, and sometimes merging imperceptibly into the bracts of the inflorescence. All leaves strigose-pubescent above and below, especially near the margins and near the base of the plant. Basal leaves, if present, obovate, obtuse, pubescent, 1–12, narrowed into well-defined petioles. Inflorescence a

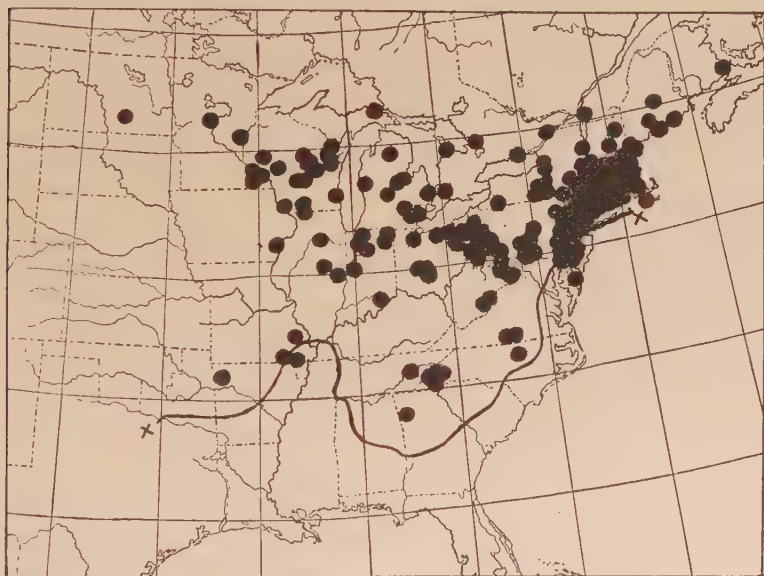


FIG. 15. Range of *LOBELIA SPICATA*, var. *ORIGINALIS*.

terminal virgate spike, 20–30 (60) cm. long, usually less than half the height of the plant, interrupted, not noticeably secund, bearing few–100 (in cases of fasciation 200 or more; the average is 30–60) flowers upon short (in fruit 5–8 mm.), slender, rough-puberulent pedicels, each with a pair of inconspicuous bracteoles near the base. Flower-bracts smooth (rarely ciliate-pubescent), narrowly lance-linear, about equalling the pedicels, or larger below, lanceolate, to 2.5 cm. long. Calyx in anthesis flattish or broad-conic, smooth or sparingly pubescent, becoming hemispheric in fruit, strongly ribbed, about 3.5 mm. in diameter. Capsule $\frac{1}{2}$ – $\frac{2}{3}$ inferior. Calyx-lobes subulate to deltoid, usually flat, 2.0–7.5 mm. long, smooth or somewhat bristly-ciliate; auricles usually present at the base of each lobe, distinctly short-triangular, or longer; in extreme cases filiform, as long as 1.0 mm.;

sometimes lacking. Flower 9–12 mm. long, including calyx. Corolla white to dark purplish-blue, smooth outside, the lower lip pubescent at the base inside. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip ovate, slightly shorter than the tube, not sharply reflexed; two upper lobes lanceolate, curved upward. Filament-tube 3.0–3.5 (in extremes 2.5–4.0 mm.) mm. long, pubescent below, connate about half its length above. Anther-tube 1.7–2.0 mm. long, light bluish-gray, the two smaller anthers each with a tuft of white hairs at the tip; the three larger smooth or merely pubescent on the backs. Style included in anther-tube. Meadows and thickets, preferring moist, rich soil (frequently in pastures and hayfields; becoming rather weedy); New Brunswick to Pennsylvania, and south in the mountains to Georgia; west to northern Michigan, eastern Minnesota and eastern Missouri; southern North Dakota; north-western Arkansas. Intergrading freely in the western part of its range with the vars. *hirtella* and *leptostachys*. Occasional plants in the Eastern States which are referred to var. *hirtella* seem rather to be more or less ciliate variants of typical var. *originalis*. Flower June 15–August 1, apparently a few days earlier along the Atlantic Seaboard. Representative Material seen: NEW BRUNSWICK: WESTMORELAND: Moncton, *Brittain*, herb. G. S. Can. 15266 (O). QUEBEC: HULL: Hull, *Harrington*, Jy. 14, 1905 (Toronto). ROUVILLE: Abbotsford, *Knowlton*, Aug. 1923 (G, Mo). ONTARIO: BRUCE: Big (=Dorcas) Bay, *Krotkoff* 7835 (Toronto). ESSEX: Sandwich, *Macoun* 724 (Toronto); *Macoun* (herb. G. S. Can. 88020) (O). GRENVILLE: *Thomson*, Jy. 1896 (Toronto). MIDDLESEX: London, *Millman*, Jun. 1879 (Toronto). MUSKOKA: Port Sydney, *Ivey*, Aug. 7, 1907 (Toronto). MAINE: ANDROSCOGGIN: South Poland, *Furbish*, ann. 1893, 1896, 1897 (NE). CUMBERLAND: Cumberland, *Chamberlain*, Jy. 1903 (US, W). FRANKLIN: Farmington, *Anderson* 684 (Toronto). HANCOCK: Mt. Desert, fields, *Redfield*, Jy. 1885 (ANS, NE). KENNEBEC: Augusta, *E. C. Smith*, Jy. 1886 (Mo, NE). LINCOLN: Bristol, *Chamberlain*, Jy. 1896 (NE). OXFORD: Rumford, *Parlin*, Jy. 1889 (NE). PISCATAQUIS: Dover, *Fernald* 311 (G, Mo, NB, NE, US, W). WASHINGTON: Machiasport, *Knowlton*, Jy. 1932 (NE). YORK: Kennebunk, *Hill* 107 (CU). NEW HAMPSHIRE: CARROLL: E. Wolfboro, *J. H. Fassett*, Jy. 1926 (W). CHESHIRE: Jaffrey, *Robinson* 231 (G, NE). COÖS: Gorham, *Pease* 16706 (NE); perhaps nearer var. *hirtella*. GRAFTON: Hanover, *Williams*, Jy. 1910 (G). HILLSBOROUGH: Peterboro, *Batchelder*, Jy. 1913 (US). MERRIMACK: Hooksett, *Batchelder*, Jy. 1921 (NE). ROCKINGHAM: Derry, *Batchelder*, Jy. 1913 (NB, NE). VERMONT: BENNINGTON: Manchester, *Day* 121 (G, US). CALEDONIA: Lyndon, Jy. 21, 1873 (NB). ORANGE: Fairlee, *Denslow*, Jy. 1923 (NB). RUTLAND: Clarendon, *Eggleston* 1423 (NB, US). WINDHAM: Vernon, *Robinson*, Aug. 1898 (G). WINDSOR: Queechee Gulf, *Kennedy*, Jy. 1890 (G). MASSACHUSETTS: BERKSHIRE: Stockbridge, *Hoffmann*, Aug. 1902 (NE). BRISTOL: Swansea, *Sanford* 10336 (part) (NE); Dartmouth, *Fernald* 1068 (part)

(NE). DUKES: Chilmark, *Harris*, Jy. 1898 (NE). ESSEX: *Oakes* (G, Mo, US). FRANKLIN: Buckland, *Forbes*, Aug. 1908 (NE). HAMPDEN: Granville, *Seymour* 396 (G). HAMPSHIRE: Prescott, *Goodale et al.*, Jy. 1931 (NE). MIDDLESEX: Framingham, *Eames*, Jy. 1906 (CU, UP). NORFOLK: Grantville, *Boott*, Jy. 1854 (NE). PLYMOUTH: Bridgewater, *Cushman*, Jy. 1908 (W). SUFFOLK: Revere, *Young*, Jy. 1877 (NE). WORCESTER: Webster, *Knowlton*, Jy. 1903 (NE). RHODE ISLAND: BRISTOL: Barrington, *Sanford* 10327 (NE). KENT: Warwick, *Fernald*, Jun. 1910 (G, NE). NEWPORT: Middletown, *Simmons*, Jy. 1898 (NE). PROVIDENCE: Providence, *Thurber*, Jun. 1844 (G). CONNECTICUT: FAIRFIELD: Greenwich, *Cushman and Sanford* 1129 (NE, W). HARTFORD: Southington, *Bissell*, Jy. 1897 (part) (Mo). LITCHFIELD: S. Canaan, *Greenman* 1423 (Mo). NEW HAVEN: New Haven, *Safford* 223 (US). NEW LONDON: Franklin, *Woodward*, Jy. 2, 1906 (G). NEW YORK: ALBANY: Elsmere, *House* 18401 (CU). BROOME: Binghamton, *Millsbaugh*, Jy. 1881 (CM). CATTARAUGUS: Quaker Bridge, *Alexander*, Aug. 1926 (NYS). CHEMUNG: Elmira, *Lucy* 12125 (NB). CHENANGO: Brisben, *Coville*, Jun. 27, 1887 (US). COLUMBIA: Kinderhook, *McVaugh* 2673 (CU, NYS, UP). DELAWARE: Bovina, *Hoy*, Jy. 1892 (CU). DUTCHESS: Stissing Mt., *McVaugh* 2862 (CU, NYS, UP). ESSEX: Minerva, *House* 15172 (NYS). GREENE: Platte Clove, *Williamson*, Jy. 1903 (ANS). HAMILTON: Back Log Camp, *M. E. Leeds* 1748 (ANS). LEWIS: Castorland, *Hotchkiss* 2667 (NYS). ONEIDA: Forestport, *Haberer* 2865 (G). ORANGE: Port Jervis, *Mackenzie* 4175 (Mo, NB). OSWEGO: Fulton, *DeForest*, Aug. 1882 (CU). QUEENS: Richmond Hill, *Bicknell* 8133 (NYS). RICHMOND: Garretsons, *Britton*, Jun. 1879 (ANS). SCHENECTADY: Schenectady, *Arnold*, ann. 1843 (CU). TIOGA: Apalachin, *Fenno* 262 (NB, NYS). TOMPKINS: Groton to McLean, *Randolph* 10819 (CU, G, NYS). ULSTER: Lake Minnewaska, *Sowden*, Jun.-Jy. 1922 (ANS). WASHINGTON: Shushan, *Dobbin* 166 (NYS). WEST-CHESTER: nr. Croton, *Pennell* 7673 (ANS). NEW JERSEY: BERGEN: Westwood, *Pennell* 9430 (ANS). BURLINGTON: Burlington (ANS). CAMDEN: Lindenwold, *Stone* 6570 (ANS). CUMBERLAND: Vineland, *Gross*, Aug. 1869 (ANS). HUDSON: Hoboken (NB). HUNTERDON: Bloomsbury, *Bebler*, Jy. 1927 (UP). MORRIS: Chatham, *Mackenzie* 245 (CCD). OCEAN: Highpoint, *Timmerman*, Jy. 1890 (NB; perhaps an error in locality). PASSAIC: Pompton Lakes, *Mackenzie* 4218 (US). SOMERSET: Watchung, *Moldenke* 1295 (ANS, Duke, Mo, NB, UP). SUSSEX: Cranberry Lake, *Mackenzie* 2749 (Mo). WARREN: Oxford, *Wherry*, Jun. 1934 (UP). PENNSYLVANIA: ALLEGHENY: Glenshaw, *Bright*, Jun. 1911 (CM). ARMSTRONG: S. W. *Knife* (CM). BEAVER: *Andriessen*, ann. 1880-90 (CM). BERKS: Hamburg, *Leibelsperger* 366 (ANS). BLAIR: Altoona, *Mellor*, Jy. 1889 (CM). BUCKS: Neshaminy, *McDowell* 309 (ANS). BUTLER: Saxonburg, *Shafer* 65 (CM, CU, Pa, UP). CARBON: Leighton (ANS). CENTER: Juniata Jct., *Wherry*, Jun. 1934 (UP). CHESTER: W. Chester, *Wm. Darlington*, Short herb.

(ANS). CRAWFORD: Hartstown, *Jennings*, Jun. 1922 (CM). DAUPHIN: Harrisburg, *Small*, Jun. 1888 (G). DELAWARE: Newtown Twp., *MacElwee* 503 (ANS, G, Mo). FRANKLIN: Mercersburg, *T. Green*, May 1845 (ANS). LACKAWANNA: Dalton, *Twining*, Jy. 1907 (CM). LANCASTER: Reinholds, *Small*, Jun. 1890 (US). Lancaster, *Porter*, Jun. 1857 (G; type of var. *parviflora* Gray). LEHIGH: Allentown, *Pretz* 6716 (ANS). LUZERNE: Beech Haven, *Heller*, Jun. 1889 (ANS, G). MERCER: Sharon, *Aschman*, Jy. 1886 (CM). MIFFLIN: Lewistown, *Jennings*, Jy. 1908 (CM, Pa). MONROE: Pocono Lake, *Harshberger*, Jy. 1904 (ANS, Mo). MONTGOMERY: Tylersport, *Long* 24840 (ANS). NORTHAMPTON: Bethlehem, *Moser*, Jy. 1832 (US). PHILADELPHIA: Falls of Schuylkill, *Jeanes*, Jy. 1828 (ANS). SOMERSET: Stoyestown, *Patterson*, Jun. 1880 (CM). VENANGO: East Sandy, *Garber*, Aug. 1869 (ANS). WASHINGTON: Charleroi, *Jennings*, Jun. 1904 (CM). WEST-MORELAND: Ligonier to Donegal, *Jennings*, Jun. 1904 (CM). DELAWARE: NEWCASTLE: Stanton, *Randolph* 101 (CU, G). SUSSEX: Frankford, *Commons*, Jun. 1875 (ANS). MARYLAND: GARRETT: Oakland, *Shreve* 551 (US). HARFORD: Flintville, *Adams et al.* 929 (ANS). VIRGINIA: BEDFORD: *Curtiss*, Jy. 1871 (G). CAMPBELL: Lawyers Road, *Heller*, Jy. 1893 (ANS). WEST VIRGINIA: GREEN-BRIER: Cranberry Summit, *G. Guttenberg* (CM). POCAHONTAS: Rimel, *Core* 3488 (WVa). NORTH CAROLINA: BUNCOMBE: Biltmore, *Biltmore herb.* 626 (CU, M, US); Asheville, *Kraus*, Jun. 1925 (W). HAYWOOD: True Love Mt., *Blomquist* 5031 (Duke). JACKSON: Cullowhee, *Thaxter*, ann. 1887 (G). SWAIN: Great Smoky Mts., *Beardslee and Kofoid*, Aug. 1891 (Mo; near var. *leptostachys*). GEORGIA: FLOYD: Rome, *Ravenel* (Mo). ALABAMA: TALLADEGA: Riddell's Mill, *Mohr* (US; near var. *leptostachys*). TENNESSEE: KNOX: Dead Horse Lake, *Sharp*, Jun. 1930 (G). OHIO: CLARK: Springfield, *Williams* (Mo). CUYAHOGA: Berea, *Ashcroft*, Jy. 1897 (NB). ERIE: Castalia, *Jennings*, Aug. 1911 (CM). FAIRFIELD: Sugar Grove, *Werner* 98 (G). FRANKLIN: Columbus, *W.S.S.*, Torrey herb., ann. 1840 (NB). MAHONING: Perkins, *Moseley*, Jy. 1894 (Mo). SUMMIT: Akron, *Ashcroft*, Jy. 1896 (Mo). WOOD: Bowling Green, *Moseley*, Jy. 1919 (Mo). INDIANA: LAGRANGE: Mongo, *Deam* 39084 (ANS). LAKE: Pine, *Deam* 43306 (CCD). NOBLE: Kendallville, *Deam* 36624 (ANS). PORTER: Crisman, *Deam* 31564 (part) (CCD). STEUBEN: Lake Gage, *Deam*, Jun. 1903 (CCD, G, Mo, NB, US, W). WARREN: Rainsville, *Deam* 25874 (CCD). ILLINOIS: CHAMPAIGN: Rantoul, *Gleason*, Jy. 1907 (G). DUPAGE: Naperville, *Wellner*, Jun. 1896 (W). JO DAVIESS: Portage, *Lansing* 4091 (ANS). LAKE: Beach, *Umbach* 3712 (W). LASALLE: Ottawa, *Huett* (G). MC LEAN: Bloomington, *Robinson*, Aug. 1886 (G). MICHIGAN: BAY: Bay City, *Dreisbach* 5958 (ANS). CHEBOYGAN: Indian River, *Ehlers* 2968 (W). CHIPPEWA: Sault Ste. Marie, *McMullen* (G). CRAWFORD: Grayling, *Mell* 214 (US); *Piper*, Jy. 1922 (US; G, in part). INGHAM: Haslett, *Yunker* 415 (US). IONIA: Hubbardston, *E. F. Smith*, ann. 1877 (G). MASON: Ludington,

Chaney 12 (US). MENOMINEE: Menominee, *Schuette*, Jun. 1891 (US, W). MIDLAND: Midland, *Dreisbach* 102 (ANS). ST CLAIR: Port Huron, *Glatfelter*, Jy. 1888 (Mo). WASHTENAW: Whitmore Lake, *Ehlers* 1488 (G). WAYNE: Detroit, *Lugger*, Jy. 1891 (M). WISCONSIN: ADAMS: Friendship, *Rhoades*, Jy. 1927 (CU). BROWN: DePere, *Kellogg*, Jy. 1888 (US). BUFFALO: nr. Fountain City, *Finkelburg* (CM). CRAWFORD: Prairie du Chien, *H. H. Smith* 7636 (W). DANE: Madison, *Sprague* 1200 (W). DUNN: Menomonie, *Bachman*, Jy. 1928 (W). EAU CLAIRE: Fall Creek, *Kunz* 220 (W). IOWA: Dodgeville, *Breakey*, Jun. 1929 (W). JACKSON: Black River Falls, *H. H. Smith* 6795 (W). JUNEAU: Camp Douglas, *Mearns* 529 (NB). LAFAYETTE: Fayette, *Cheney*, Jy. 1888 (W). MARATHON: Mosinee, *Cheney* 3270 (W). MARINETTE: Athelstane, *Davis*, Jy. 1915 (W). MILWAUKEE: Milwaukee, *Hasse* (NB). WALWORTH: E. Troy, *Almon*, Aug. 1926 (W). WAUPACA: Readfield, *A. Smith* 110 (W). WAUSHARA: Richford, *Taylor*, Jy. 1932 (W). MINNESOTA: CASS: Bridgeman, *Sheldon* 3289 (part) (M). MILLE LACS: Princeton, *Sheldon* 3116 (M). OLMSTED: Rochester, *Ainslee*, Jy. 4, 1902 (M). SCOTT: Savage, *Rosendahl*, Sep. 1924 (part) (M). WABASHA: Lake City, *Manning*, Jy. 1892 (M). WASECA: Janesville, *Taylor* 550 (M). MISSOURI: BUTLER: Poplar Bluff, *Eby*, Jy. 1893 (Mo). IRON: Pilot Knob, *Glatfelter*, Aug. 1895 (Mo). ST. LOUIS: *Engelmann*, May 1836 (ANS); *Eggert*, Jun. 1879 (Mo). ARKANSAS: WASHINGTON: Fayetteville, *Watts*, Jun. 1925 (W); this plant is perhaps related to *L. appendiculata*. NORTH DAKOTA: KIDDER: Dawson, *Metcalf* 274 (CU).

c) Var. *HIRTELLA* Gray, Syn. Fl. 6. 1878. TYPE LOCALITY: "chiefly towards and beyond the Mississippi." TYPE SPECIMEN: authentic material seen in the Gray Herbarium.—*L. hirtella* Greene, *Pittonia* III: 349. Sep. 27, 1898.—Differs from the var. *originalis* in being bristly-pubescent nearly throughout; the lower stem is bristly, especially on the angles. Flower-bracts densely bristly, especially near the margins; the lower usually lanceolate, leafy, to 2.5 cm. long, often exceeding the flowers. Calyx densely bristly, especially on the conspicuous ribs. Calyx-lobes usually narrowly lance-linear (sometimes deltoid), 3.5–7.0 mm. long, bristly; often with a conspicuous raised midrib. Calyx in fruit hemispheric or varying to ovoid, 3.5–6.0 mm. long and 3.0–3.5 mm. across; capsule $\frac{1}{2}$ – $\frac{3}{4}$ inferior. Auricles of the calyx-lobes often conspicuous. Plants as a rule smaller than var. *leptostachys* or var. *originalis*; mostly 15–60 cm. high. Inflorescence usually 30–60 flowered. Leaves in many cases clustered on the lower half of the stem.—Low open meadows and prairies; sometimes in dry soil, north-western Indiana to eastern Kansas, northwest to western Nebraska, South Dakota, northern Minnesota, Saskatchewan (north to the 52d parallel), and Alberta. In nearly or quite typical form passing eastward through Michigan, northern New York and New England to the Gaspé Peninsula; apparently common on Long Island. Flower June 1–August 1; somewhat earlier in the southern part of its

range than in the northern. Representative Material seen: QUEBEC: GASPÉ: mouth of Grand River, *Pease* 5255 (G). HULL: Chelsea, *Harrington*, Jy. 1908 (O). ONTARIO: BRUCE: Big (=Dorcas) Bay, *Krotkoff* 7835 (G). DURHAM: Hampton, *Allin*, Jy. 1927 (Toronto). ESSEX: Leamington, *Macoun*, herb. G. S. Can. 54135 (O). HASTINGS: Belleville, *Macoun* 1115 (G); *Macoun* 48 (Toronto). MUSKOKA: Port Sydney, *Ivey*, Jy. 31, 1906 (Toronto). TIMAGAMI FOREST RESERVE: *Watson* 1923 (Toronto). MAINE: ANDROSCOGGIN: E. Auburn, *Merrill* 589 (NE). CUMBERLAND: Brunswick, *Furbish*, ann. 1899 (NE). FRANKLIN: Chesterville, *Chamberlain*, Jy. 1902 (NE). HANCOCK: Swan Island, *Hill* 2247 (NE). OXFORD: Newry, *Williams*, Jy. 1906

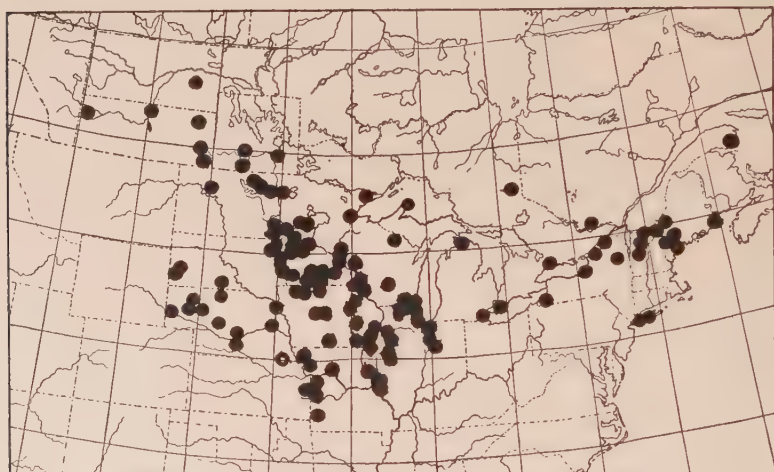


FIG. 16. Range of *LOBELIA SPICATA*, var. *HIRTELLA*.

(G). PISCATAQUIS: Milo, *Fernald*, Sep. 1900 (NE). SOMERSET: Dead River, *Fernald*, Aug. 1896 (NE). WASHINGTON: Carlow Island, *Fernald* 2133 (G, NE). YORK: N. Berwick, *Parlin*, Jy. 1893 (part) (G). NEW HAMPSHIRE: COÖS: Randolph, *Pease* 18076 (NE). VERMONT: CALEDONIA: Peacham, *Blanchard*, Jy. 1892 (Mo). ORLEANS: Willoughby, *Winslow*, Jy. 1904 (NE). RUTLAND: Brandon, *Dutton*, Jy. 1909 (Mo). NEW YORK: CHAUTAUQUA: Nashville, *Perkins*, Jy. 1927 (CU). ESSEX: Newcomb, *House* 9078 (G, NYS). NASSAU: Hempstead, *Gershoy* 995 (CU). ST. LAWRENCE: Lisbon, *Phelps* 914 (G, NB). SUFFOLK: Babylon, *Clute* 157 (CM). INDIANA: CLARK: Clarke, *Umbach* 3867 (W). LAKE: Gary, *McCoy*, Jun. 1933 (Duke). NEWTON: Morocco, *Deam* 31675 (CCD). PORTER: Dune Park, *Umbach* 1074 (W). PULASKI: San Pierre, *Deam* 43239 (CCD). WHITE: Idaville, *Deam* 48852 (CCD). ILLINOIS: COOK: Chicago, *Moffatt* 1883 (W). DUPAGE: Naperville, *Umbach* 5532 (W). HANCOCK:

Augusta, *S. B. Mead*, Jun. 1859 (ANS). HENDERSON: Oquawka, *Patterson* (ANS, US). LAKE: Beach, *Johnson 1821* (NB). MC HENRY: Ringwood, *Vasey* ann. 1862 (G). MASON: Killbourne, *Gleason*, Aug. 1903 (G). MENARD: Athens, *Hall*, ann. 1861 (G, Mo). OGLE: Holcomb, *Beck*, Jy. 1907 (W). PEORIA: Peoria, *McDonald*, Jun. 1903 (NB); Jun. 1904 (G). ROCK ISLAND: Joslin, *Harper*, Jy. 1886 (W). STARK: Wady Petra, *Chase 592* (ANS, Mo). WILL: Romeo, *Powell*, Jun. 1898 (W). WINNEBAGO: prairies, *Bebb*, Jy. 1858 (G). MICHIGAN: CHEBOYGAN: Burt Lake, *Ehlers 4634* (CU). KEWEENAW: Keweenaw Point, *Wood 1642* (NC, US); sterile hills, *Farwell*, ann. 1889 (G; fid. A. Gray). MONROE: Raisinville, *Atkinson*, Jun. 1883 (CU, US). WISCONSIN: BUFFALO: nr. Fountain City, *Finkelnburg* (M). DANE: Primrose, *Fassett 3459* (G, NB, W). LACROSSE: LaCrosse, *Trelease* (probably), Jy. 1887 (Mo). RACINE: Racine, *Davis*, Jun. 1881 (W). ROCK: Janesville, *Skavlen*, Jun. 1889 (W). SAUK: Baraboo, *True* (W). VERNON: Viroqua, *H. H. Smith 7218* (W). WALWORTH: Delavan, *Hollister 25* (US). WINNEBAGO: Winnebago, *James*, Jy. 1894 (W). MINNESOTA: BLUE EARTH: *Leiberg*, ann. 1883 (M). BROWN: Springfield, *Sheldon*, Jy. 1891 (M). CHIPPEWA: Montevideo, *Moyer*, Jy. 1891 (M). CHISAGO: *Sandberg*, Jun. 1886 (M). CLAY: Glyndon, *Solheim 165* (R). DOUGLAS: Lake Christina, *Sheldon 3466* (M). HENNEPIN: meadows, *Sandberg*, Jy. 1890 (M, W). HOUSTON: Spring Grove, *Rosendahl 477* (M); 501 (G). JACKSON: Heron Lake, *Skinner*, ann. 1902 (M). KANDIYOHI: Spicer, *Frost*, Jy. 1892 (G, M, W). LAKE: Echo Lake, *Barber 12* (G). NICOLLET: Nicollet, *Ballard*, Jy. 1892 (M, R, US). OLMSTED: Rochester, *Ainslee*, Jun. 19, 1902 (part) (M). OTTER TAIL: Fergus Falls, *Sheldon 3699* (M). PIPESTONE: Pipestone, *Sheldon 1475* (M). POLK: Crookston, *MacMillan and Skinner 57, 297* (M). POPE: Glenwood, *Taylor*, Jy. 1891 (M). RAMSEY: New Brighton, *Moyer*, Jun. 1897 (M). ST. LOUIS: Duluth, *Johnson 1263* (part) (NB). SCOTT: Savage, *Rosendahl*, Sep. 1924 (part) (M). STEARNS: Pleasant Lake, *Campbell C165* (M). WATONWAN: St. James, *Fowler 25037* (W). WINONA: Winona, *Holzinger*, Aug. 1890 (US). IOWA: BENTON: Vinton, *Davis* (W). BLACK HAWK: low prairie, *Burk 388* (Mo). DECATUR: *J. P. Anderson*, Jun. 1902 (Mo, R). EMMET: *Armstrong*, *Cratty*, Aug. 1898 (US). FAYETTE: *Fayette*, *Parker* (M). GREENE: Grand Junction, *Wiegand et al. 2401* (CU). JOHNSON: Iowa City, *Somes 3202, 3204* (US). KOSSUTH: Wesley, *Breithaupt*, Jun. 1898 (W). STORY: Ames, *Ball and Combs 500* (G, Mo, R, US). VAN BUREN: Bentonsport, *Graves 1894* (Mo). MISSOURI: CHARITON: *Young*, Jun. 1925 (CM). JEFFERSON: "Crystall City," *Eggert*, Aug. 1886 (CM). MARION: Hannibal, *Davis 1190* (Mo). NODAWAY: Marysville, *Palmer 25434* (Mo). NORTH DAKOTA: "upper James River," (no state given), *Geyer*, Nicollet's N. W. Exp., Jy. 13, 1839 (US). BENSON: Leeds, *Lunell*, Jy. 6, 1901 (ANS, M, R, W). CASS: Buffalo, *Westergaard*, Aug. 1897 (R). GRAND FORKS: Grand Forks, *Brannon 240* (Mo). NELSON: Tolna, Jy. 25, 1911 (R). RICH-

LAND: Fairmount, *Bergman* 2326 (ANS, M, Mo). WARD: Minot, *Lakela* 489 (M). SOUTH DAKOTA: BROOKINGS: Brookings, *Williams*, Jy. 21, 1893 (ANS, M, Mo). CUSTER: Custer, *Rydberg*, 850 (US). DAY: Waubay, *Moore* 55 (M). DEUEL: Toronto, *Moore* 885 (M). MEADE: Piedmont, *Pratt*, Jun. 1895 (M). MOODY: Flandreau, *Griffiths*, Aug. 1892 (Mo, US). ROBERTS: White Rock, *Powell*, ann. 1903 (G). TRIPP: Keya Paha River, *E. J. Wallace* (NB). NEBRASKA: BROWN: Long Pine, *Bates*, Jy. 1895 (M). BUFFALO: Kearney, *E. R. Holmes*, Jun. 1887 (NB); "Ft. Kearney on the Platte," *H. Engelmann*, Jun. 1858 (Mo.). CEDAR: Aten, *Clements* 2656 (CU, Del, G, M, US). CHERRY: sand-hills, *Smith and Pound* 37 (Mo). CUSTER: Callaway, *Bates* 2358 (G). GRANT: Whitman, *Rydberg* 1818 (G, US). KEARNEY: Minden, *Hapeman*, Jy. 1897 (W). PLATTE: Columbus, *Pennell* 16014 (ANS). SCOTTS BLUFF: Platte Bottom, *Rydberg* 222 (US). THOMAS: Halsey, *Krautter*, Jy. 1907 (UP). KANSAS: LEAVENWORTH: "Ft. Kearney to Ft. Leavenworth," *Fendler* 79 (G). MIAMI: Paola, *Oyster*, Jy. 1883 (US). MANITOBA: "N. W. Territory," *Nicollet* 414 (ANS) (not surely from Man.). BRANDON: Brandon, *Macoun*, herb. G. S. Can. 14146 (O, US). SOURIS: Turtle Mt., *T.J.W.B.* 139, Jy. 1874 (Toronto). WINNIPEG: Winnipeg, *Scott*, Jy. 1904 (Toronto). SASKATCHEWAN: "20 m. W. Yorkton, along Grand Trunk Pacific R. R.," *Macoun*, herb. G. S. Can. 78479 (CM, CU, G, O); Moose Mt., *Macoun*, Jy. 1883 (Del); "near the South Saskatchewan," *Macoun*, herb. G. S. Can. 15253 (O). ASSINIBOIA: Souris Plain, *Macoun*, herb. G. S. Can. 15254 (O). HUMBOLDT: Wadena, *McGugan* (Toronto); Touchwood Hills, *Macoun and Herriot*, herb. G. S. Can. 78480 (O). ALBERTA: CRAIGMYLE: prairie, "SE 28-32-16 W 4," *Brinkman*, Jy. 1923 (US).

NOTE: While the above are all referred to the var. *hirtella*, it should be observed that the variety reaches its most characteristic form only in the region west of the Mississippi, and occasionally eastward. From Wisconsin eastward, most plants seen lack the short stature of the prairie plant, and are placed in var. *hirtella* because of the combination of general bristly pubescence, combined with leafy flower-bracts.

d) Var. **campanulata**, var. nov.; caule paucifloro, calycis tubo oblongo vel hemisphaerico, antheris albis, capsulis subinflatis. TYPE LOCALITY: Kinderhook, Columbia Co., N. Y. TYPE SPECIMEN: *McLaugh* 26734; deposited at the University of Pennsylvania; duplicates at Cornell University and the New York State Museum. Vegetatively not to be distinguished from the var. *originalis*. Inflorescence a loose terminal raceme, hardly more than a third the height of the plant, not noticeably secund, bearing 10-35 (50) (ave. 20-25) widely spaced flowers upon short (in fruit 4-5 mm.), rather stout, rough-puberulent pedicels, each with a pair of inconspicuous bracteoles near the base. Flower-bracts smooth, linear, somewhat longer than the pedicel (5-9 mm. long), callose-denticulate. Calyx in bud



TYPE of LOBELIA SPICATA Lam.

and in anthesis short-campanulate, smooth or slightly puberulent, becoming sub-globose in fruit, strongly ribbed, 3.5–5.0 mm. across by 4.5–6.0 mm. high. Capsule $\frac{2}{3}$ inferior or more. Calyx-lobes short-lanceolate, flat, 3–4 mm. long, smooth, entire; auricles lacking. Flower 7–9 mm. long, including the campanulate calyx. Corolla distinctly dark-purplish, smooth, except for the slightly pubescent base of the lower lip. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip ovate-oblong, slightly shorter than the

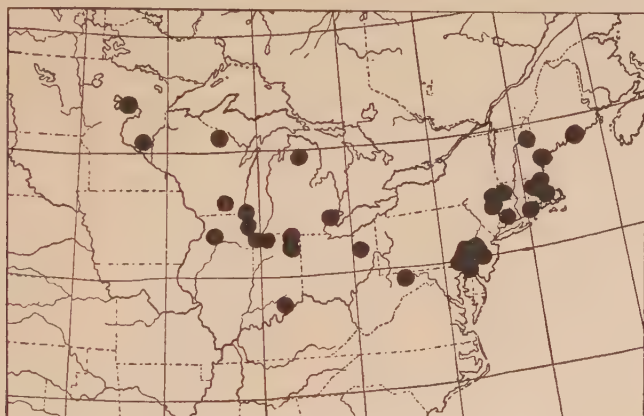


FIG. 17. Range of *LOBELIA SPICATA*, var. *CAMPANULATA*.

tube, not sharply reflexed; two upper lobes lanceolate. Filament-tube 2.0–2.5 (3.0) mm. long, slightly pubescent below, connate about half its length above. Anther-tube 1.0–1.5 mm. long, white, the two smaller anthers tufted, the three larger smooth or pubescent on the backs. Style exserted, recurved. Seeds apparently somewhat larger than in var. *originalis*.

This plant differs from var. *originalis* by the campanulate calyx, the globose, larger capsules, white anthers, smaller flowers in every way, fewer flowers, earlier flowering period (7–10 days in eastern New York). It probably does not deserve specific rank, as plants with white anthers and small flowers are sometimes found in the other varieties of *L. spicata*. This phenomenon may be one of arrested development or some other abnormality, as similar conditions are seen occasionally in other parts of the genus (e.g. *L. puberula*). However, when the earlier flowering period is considered, as well as the definite changes in calyx, capsule and inflorescence, it seems desirable to separate this plant from var. *originalis*.

Everywhere with var. *originalis*, but apparently rare except on the Eastern Seaboard from southern Maine to Pennsylvania; from Pennsylvania to Virginia it intergrades freely with the var. *scaposa*.

Flowers a few days earlier than var. *originalis*; from June 1. Material seen: MAINE: HANCOCK: Mt. Desert, fields nr. Long Pond, *Redfield*, Jy. 1892 (part) (NE). YORK: N. Berwick, *Parlin*, Jy. 1892 (1 sheet) (G). NEW HAMPSHIRE: COÖS: Dalton, *Pease 12150* (part) (NE). VERMONT: ADDISON: Ferrisburgh, *Horsford*, ann. 1882 (part) (G). MASSACHUSETTS: BERKSHIRE: Tyringham, *Fail*, Jun. 1897 (NB). BRISTOL: Swansea, *Sanford 10336* (part) (NE); Dartmouth, *Fernald 1068* (part) (NE). ESSEX: Montserrat, *Hubbard*, Jy. 1913 (NE); S. Georgetown, *Williams*, Aug. 1899 (NE). MIDDLESEX: Concord, *Deane*, Jy. 1886 (NE). S. Acton, *Deane*, Jy. 1886 (part) (US); Chelmsford, *Eames*, Sep. 1914 (CU). NORFOLK: Needham, *Fuller*, Jy. 1883 (part) (NE); Norfolk, *Ware 2485* (part) (NE). CONNECTICUT: *Chas. Wright* (part) (CM). HARTFORD: Southington, *Bissell*, Jy. 1897 (part) (Mo). NEW LONDON: Franklin, *Woodward*, Jy. 11, 1906 (G, NE). NEW YORK: COLUMBIA: Kinderhook, *McLaugh 2673A* (CU, NYS, UP). DUTCHESS: Madalin, *McLaugh 2674A* (UP). ST. LAWRENCE: Lisbon, *Phelps 914* (CU). NEW JERSEY: BURLINGTON: Mt. Holly, *Meredith*, Jun. 1922 (ANS). PENNSYLVANIA: BERKS: Lobachsville, *Long 12632* (ANS). BUCKS: Upper Black Eddy, *True*, Jy. 1925 (part) (UP). CHESTER: Paoli, *Pennell 3905* (part) (UP); West Chester, *Pennell 1224* (ANS). DELAWARE: Haverford, *Burk* (part) (UP); Lenni, *Redfield 4516* (Mo); Wawa, *Pennell 21* (part) (ANS); Williamson, *Pennell 194* (part) (ANS). LANCASTER: Lancaster, *Stevens*, Jy. 1874 (part) (Mo). MONTGOMERY: Penllyn, *MacElwee*, Jun. 1903 (1 plant, ANS). NORTHAMPTON: Easton, *Porter*, Jun. 1896 (ANS). DELAWARE: NEWCASTLE: Centreville, *Commons*, Jun. 1866 (part) (ANS). MARYLAND: GARRETT: dry open woods, *J. D. Smith*, Jy. 24, 1883 (US). OHIO: STARK: Canton, *Steele 14* (US). INDIANA: CLARK: *Deam 6897* (part) (CCD). LAGRANGE: Mongo, *Deam 20706* (CCD). LAKE: Hammond, *Deam 1456* (part) (CCD). NOBLE: Eagle Lake, *Deam 31252* (part) (CCD). PORTER: Crisman, *Deam 31564* (part) (CCD). ILLINOIS: *Vasey*, herb. Olney (G). COOK: Chicago, *Babcock*, Jun. 1874 (part) (US). LAKE: Waukegan, *Umbach 5840* (W). WHITESIDE: Fulton, *Harper*, Jun. 1892 (W). MICHIGAN: CRAWFORD: Grayling, *Piper*, Jy. 1922 (part) (G). WAYNE: Detroit, grassy fields, *Farwell*, Jun. 1900 (part) (G). WISCONSIN: DANE: Madison, *Trelease*, Jun. 1889 (part) (Mo). MINNESOTA: ANOKA: Centreville, *Sandberg*, Jy. 30, 1891 (part) (Del); "Northern A. Co.," *Butters and Rosendahl 5056* (M). CASS: Bridgeman, *Sheldon 3289* (part) (M); this also shows its affinity to var. *hirtella*. OLMSTED: Rochester, *Ainslee*, Jun. 1902 (part) (M). IOWA: DECATUR: *Fitzpatrick*, May 1896 (part) (Mo).

e) Var. *scaposa*, var. nov., foliis radicalibus ovatis obtusis petiolatis, caulinis raris parvis, racemo elongato laxo, calycis appendicibus non longis. TYPE LOCALITY: "Danville to Fall Creek" (Pittsylvania Co., Va.). TYPE SPECIMEN: *Small and Heller 108*, Jun. 3, 1891, in the University of Penna.—Possibly *L. pallida* Muhlenberg, Cat. Pl. Am. Sep. 22. 1813. Probably *L. pallida* Elliott, Sk. Bot. S. C. & Ga.

I: 265. 1821 (in part). Probably *L. paniculata* Rafinesque, N. Fl. N. Am. II: 18. 1836. *L. spicata* Hitchcock and Standley, Fl. Dist. Col. 263. 1919.—Stem strict, unbranched, 40–110 cm. high (ave. about 65 cm.), green, or with a slight reddish tinge near the base; smooth, or pubescent, especially on the angles, below. Cauline leaves inconspicuous, thin, 1–6, usually only about 3 in number, all below the middle of the stem, all acute, bract-like, 1–2 cm. long, lanceolate, sharp-denticulate, or the lowest one oblanceolate or oblong, obtuse, about 1.5×5.0 cm. (in extreme cases 2.5×9.0 cm.). Basal leaves 1–12, conspicuous, obovate, ovate or round, narrowed into margined petioles, $1.5\text{--}5.5 \times 3\text{--}10$ cm. (ave. about 3.5×5). All leaves more or less strigose-pubescent, especially near the margins and near the base of the plant. Inflorescence a loose terminal raceme, 10–60 cm. long (ave. about 30 cm.), usually about half the height of the plant, appearing naked, because of the disproportionately large basal leaves; somewhat interrupted, sometimes sub-secund, bearing 10–90 (ave. about 40) widely spaced flowers upon short (in flower 4–6 mm.) slender pedicels, each with a pair of inconspicuous bracteoles near the base. Flower-bracts smooth, lance-linear or sometimes narrowly lanceolate, about equalling the pedicels, 4–10 mm. long. Calyx in anthesis broad-conic, smooth, becoming hemispheric to sub-globose in fruit, about 4 mm. in diameter. Capsule (where seen) $\frac{2}{3}$ inferior. Calyx-lobes lanceolate to linear, 2–6 mm. long, smooth, entire; auricles usually conspicuous at the base of each lobe, triangular or short-filiform. Flower 7.0–10.5 mm. long, including calyx (ave. 9.0 mm.). Corolla pure white to light blue, the lower lip pubescent at base inside, otherwise smooth. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip ovate, shorter than the tube, sometimes sharply reflexed in dried material; the two upper lobes lanceolate, recurved or erect. Filament-tube 3.0–3.5 mm. long, pubescent below, connate about half its length above, often deflexed, so that the anther-tube and the upper part of the filament-tube are not contained in the corolla, but project above it, through the dorsal fissure. Anther-tube 1.7–2.0 mm. long, light bluish-gray, the two smaller anthers tufted at the tip, the three larger smooth or pubescent on the backs.

Differs from var. *originalis* by the larger basal leaves, fewer stem-leaves, the naked inflorescence, which is longer in proportion, the more conspicuous auricles, slightly smaller flowers, broader calyx, earlier flowering period. Is sometimes confused with var. *leptostachys* because of the auricles, which may be conspicuous, but the almost naked stem should prevent such a mistake.—Low open woods and hillsides, in moist or dry situations, southern Pennsylvania to central North Carolina, central Mississippi, and Louisiana. Apparently mostly confined to the Piedmont. Flower May 20–June 20. Material seen: PENNSYLVANIA: *Rev. J.H.B.* (Porter herb.), Jun. 10, 1845 (ANS). FRANKLIN: Mercersburg, *Detwiller herb.*, Jun. 2, 1845

(ANS); Mt. Alto, *Illick*, ann. 1909 (Mo). FULTON: Big Cove Tannery, *Gress*, Aug. 1921 (Pa). YORK: Loganville, *Glatfelter*, Jun. 1895 (Mo); York Furnace, *Stone* 2919 (ANS). MARYLAND: ALLEGANY: Cumberland, *J. D. Smith*, Jy. 1883 (US); Cumberland, *Shriver*, Jy. 1894 (NB). BALTIMORE: *J. D. Smith*, Jun. 8, 1880 (US); "nr. Baltimore," *D. Foreman*, ann. 187- (US); Woodbrook, *Waters*, Jun. 1892 (US). CECIL: Elkton, *Long* 34066 (ANS). MONTGOMERY: Glen Echo, *Pollard* 292 (US); Chevy Chase, *Wherry*, May 1934 (UP); Rockville, *Painter* 1344 (Mo); Kensington, *House* 1000 (Mo); "nr. D. C. line at Mass. Avenue," *Bowen* #6 (UP). WASHINGTON: Harpers Ferry,

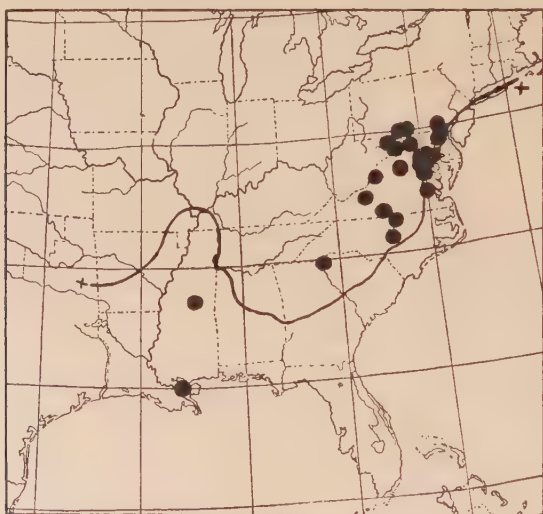


FIG. 18. Range of *LOBELIA SPICATA*, var. *SCAPOSA*.

Topping, May 1897 (US). DISTRICT OF COLUMBIA: Washington, *W. A. Henry*, Jun. 1879 (W); Rock Creek, *Comstock*, May 1881 (CU); "nr. Washington," *Blanchard*, May 1891 (NB); Washington, *Kearney*, Jun. 1897 (NB). VIRGINIA: "oak forests," *Tidestrom* 6366 (US). ARLINGTON: Ft. Myer, *Mearns*, Jun. 1895 (G, NB). BATH: Millboro, *Wherry*, Jun. 1934 (UP). CHESTERFIELD: Winterpock, *Wherry*, May 1934 (UP). FAIRFAX: Chain Bridge, *Sheldon*, Jun. 1881 (NYS); Great Falls, *Moore* 4521 (G); Occoquan, *Randolph* 157 (CU, G). MONTGOMERY: Blacksburg, *Murrill*, Jun. 1895 (NB); PAGE: Luray, *A. Brown et al.*, Jun. 1890 (ANS, NB). PITTSYLVANIA: Danville to Fall Creek, *Small and Heller* 108, Jun. 3, 1891 (ANS, M, NB, UP). PRINCE WILLIAM: Buckland, *Mercedith*, May 1922 (ANS); Gainesville, *Pennell* 13326 (ANS). SPOTSYLVANIA: Fredericksburg, *Wright, et al.*, May 1917 (CU). STAFFORD: Falmouth, *Wiegand and Manning* 3092

(CU, G). WEST VIRGINIA: HAMPSHIRE: Hanging Rock, *Frye*, Jun. 7, 1933 (WVa); Hanging Rock, *Koenig*, Aug. 1887 (WVa); Hietts Run, *W.F.U. Bot. Exp.*, Jr. 2, 1926 (WVa). NORTH CAROLINA: CHATHAM: 12 m. S. Chapel Hill, *Totten*, Jun. 1931 (NC). ORANGE: Chapel Hill, *Totten*, Jun. 1915 (NC). PERSON: *Blomquist* 5030 (Duke). SOUTH CAROLINA: OCONEE: Newry, *House* 3477 (NB). MISSISSIPPI: CHOCTAW: Ackerman, *Jensen*, Jun. 1905 (Mo). LOUISIANA: ORLEANS: "nr. New Orleans, *Dr. Ingalls*," Torrey herb. (NB).

The following list is made up of specimens which seem not to belong

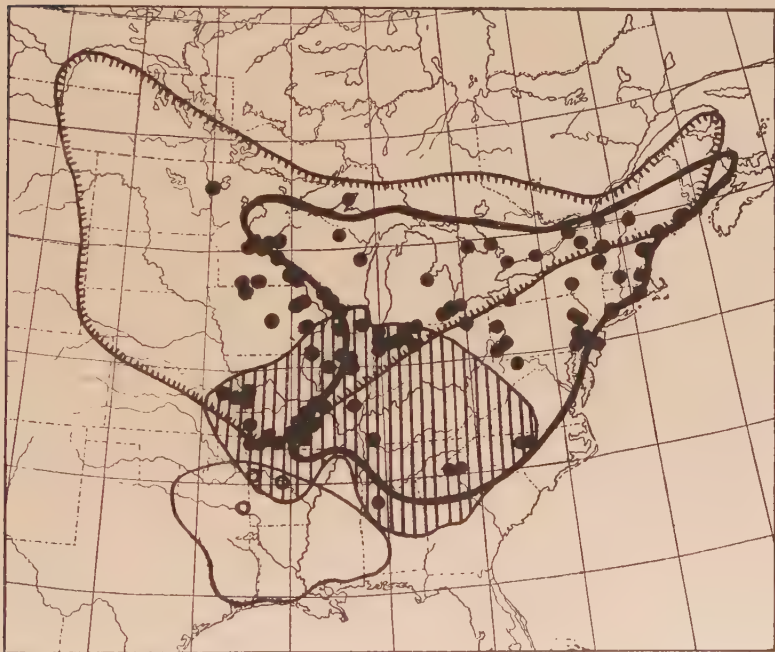


FIG. 19. Ranges of Varieties of *LOBELIA SPICATA*: Var. *LEPTOSTACHYS* (vertical lines); var. *ORIGINALIS* (oblique lines, left to right); var. *HIRTELLA* (oblique, right to left). Range of *L. APPENDICULATA* (plain). Dots represent plants not surely referred to any of the named forms; that is, intermediates. Records from the Atlantic states and southern New England are merely of occasional hairy individuals of the smooth var. *ORIGINALIS*.

to any of the named varieties of *L. spicata*, but to possess features peculiar to two or more of the varieties; that is, they seem to be intermediates of various sorts. The initials in parenthesis after each citation indicate the varieties which the specimen seems to resemble most closely. The letters "app" stand for *L. appendiculata*. VIRGINIA: STAFFORD: Falmouth, *Wiegand and Manning* 3093 (CU)

(sc-ca). KENTUCKY: CHRISTIAN: "barrens," *C. W. Short* (ANS) (lep-or). INDIANA: ALLEN: Ft. Wayne, *Deam* 1337 (CCD) (lep-or). FULTON: DeLong, *Deam* 39265 (CCD) (lep-or). KOSCIUSKO: Leesburg, *Deam* 5118 (NB) (lep-or). ILLINOIS: DUPAGE: Lisle, *Martinek*, Jy. 1919 (US) (lep-or). MACON: 6 m. W. Decatur, *Clokey*, Jy. 1915 (NYS) (lep-hir). PEORIA: Peoria, *McDonald*, Jy. 1890 (G) (lep-hir); Peoria, *Brendel* (NYS) ("Parum differt a *Lobelia spicata*, et probabiliter transit in illem"; lep-or). RICHLAND: Amity, *Ridgway* 3205 (ANS) (lep-hir). WASHINGTON: *French*, Jy. 1872 (NB) (lep-hir). WINNEBAGO: *Bebb*, Jy. 1858 (ANS) (lep-or). MICHIGAN: SAGINAW: Chesaning, *Dreisbach* 5121 (ANS) (hir-or). WISCONSIN: ONEIDA: Virgin (?) Lake, *Hoffmann*, Aug. 1918 (Mo) (hir-ca). MINNESOTA: FARIBAULT: Minnesota Lake, *Taylor* 563 (M) (hir-or). GOODHUE: Red Wing (CU) (hir-or). IOWA: DICKINSON: Lake Okiboji, *Overholts et al.*, Jy. 1926 (Mo) (hir-or). FAYETTE: *Fink* 237 (US) (hir-or). LOUISA: Columbus, *Palmer* 40551 (NB) (hir-or). MISSOURI: BATES: Broadhead, May 1871 (Mo) (hir-or). CRAWFORD: *Woodson* 595 (Mo) (hir-lep-or). GREENE: Springfield, *Standley* 9034 (US) (hir-lep); IRON: "eastern Iron Co.," *Trelease* 669 (Mo) (lep-or). JACKSON: Waldo Park, *Bush* 479 (Mo, US) (lep-hir-or); Martin City, *Bush* 3038 (G, Mo, NB) (lep-hir). JASPER: Webb City, *Palmer* 2095 (G, Mo, US) (lep-hir). LACLEDE: Lebanon, *Pennell* 11648 (part) (ANS) (lep-or). OREGON: Alton to Thayer, *Trelease*, Jy. 1895 (Mo) (lep-or). POLK: "Stockton Road," *Trelease* 449 (Mo) (lep-or). ST. CHARLES: Gilmore, *Kellogg* 2026 (Mo) (hir-or). ST. FRANCIS: Bismarck, *Dewart* 72 (Mo) (lep-or). ST. LOUIS: St. Louis, *Monell*, Sep 1838 (Mo) (hir-or); St. Louis, *Eggert*, Jy. 1875 (ANS, CM, Mo, NB, R, US) (lep-or). TEXAS: Plato, *Emig* 161 (Mo) (lep-or). ARKANSAS: BENTON: *Plank*, ann. 1899 (part) (NB) (lep-app ?). SEBASTIAN: Big Creek, *Demaree* 3137 (ANS) (? - app). OKLAHOMA: MC CURTAIN: Idabel, *Houghton* 3658 (G, Mo, NB) (app - ?). KANSAS: WABAUNSEE: *Norton and Clothier* 318 (G, Mo, R, US) (lep-hir-ca). WYANDOTTE: Rosedale, *Mackenzie*, Jy. 1896 (NB) (lep-hir).

10. *L. INFLATA* Linnaeus, Spec. Pl. II: 931. 1753. TYPE LOCALITY: "Habitat in Virginia, Canada." TYPE SPECIMEN: There are in the Linnean Herbarium in London two examples of this plant, both seen by Linnaeus before 1753. The first is marked by him "Locus e Senegall," which is no doubt an error. The second is a flowering specimen, collected by Kalm, and marked by Linnaeus "*L. Cliffortiana*." Photographs seen. This species, which in early flower lacks the characteristic inflated capsules, and bears a slight superficial resemblance to the southern *L. Cliffortiana* L., is probably the basis of the many reports of the latter species from Virginia:—*L. caule erecto, foliis cordatis* (Clayt. n. 196), Gronovius, Fl. Vir. 107. 1739. *L. cliffortiana* Michaux, Fl. Bor.-Am. II: 152. 1803. Pursh, Fl. Am. Sept. II: 448. 1814. *L. Michauxii* Nuttall, Gen. N. Am. Pl. II: 76. 1818. *L. caule erecto brachiato, foliis ovato-lanceolatis obsolete*

incisis, capsulis inflatis, Linnaeus, Hort. Cliff. 500. 1737. This plant was sent to Linnaeus by Gronovius, who had it from Clayton in Virginia; Linnaeus remarks on its similarity to *L. Cliffortiana*, but makes it a distinct species.—Stem erect, usually with many racemose axillary branches in age, sometimes becoming sub-corymbiform through elongation of the lower branches, 15–100 cm. high (ave. 30–60). (In sterile soil dwarf plants 10–20 cm. high are often seen; usually unbranched, bearing a few flowers and apparently maturing seed). Lower part of the stem usually purplish (sometimes green),



FIG. 20. Range of *LOBELIA INFLATA*.

upper part light green. Whole plant loosely long-hirsute (rarely nearly smooth), or the upper stem and upper sides of the leaves smooth or strigose. Hairs flat, chaffy, most numerous near the angles formed on the stem by the decurrent leaf-bases. Cauline leaves 10–25, obtuse and obovate or broad-ovate below; above ovate-oblong or ovate-lanceolate, short-acute; sessile or sub-petiolate below; irregularly rough-serrate or dentate; usually $1.5\text{--}2.5 \times 4.5\text{--}8.0$ cm. (sometimes larger). Upper leaves often passing gradually into the broad-leafy lower flower-bracts. Inflorescence consisting of loose racemes at the ends of the branches, the central one the largest, to 30 cm. long (usually 10–15 cm.), not secund, bearing 1–30 flowers upon slender, more or less erect, finely prickly-puberulent pedicels (5–10 mm. long

in fruit), each with a pair of inconspicuous bracteoles at the base. Flower-bracts leafy-ovate below, lanceolate or linear above, little longer than the pedicel, finely callose-denticulate, smooth or ciliate. Calyx in anthesis campanulate, smooth, becoming much inflated in fruit, oval to sub-globose, $3.5-8.0 \times 7.0-11.5$ mm. Capsule inferior. Calyx-lobes subulate or linear, $3.5-5.0$ (8.0) mm. long, smooth or rarely slightly ciliate; auricles none. Flower inconspicuous, 8-10 mm. long, including calyx. (In this species the corolla is quite short in proportion to the calyx, being only about 7 mm. long.) Corolla violet-blue to nearly white, sometimes with a suggestion of pink which shows plainly in dried material; base of the lower lip pubescent; corolla otherwise smooth. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip oblong, shorter than the tube; the two upper lanceolate. Filament-tube 2.5-3.0 mm. long, slightly pubescent below, united $\frac{2}{3}$ of its length above. Anther-tube 1.5-1.7 mm. long, bluish-gray, the two smaller anthers tufted at the tip, the three larger merely pubescent on the backs. Annual.

This species is readily identified in flower by the campanulate calyx, rather long calyx-lobes, and the short corolla, which seems even shorter in proportion to the large calyx. Flowering specimens are sometimes mistaken for *L. spicata*, as the branches often do not develop until fruit has appeared on the main axis. Fruit matures quickly, so that a single plant is in flower during a long period and still has only a few flowers open at a time, instead of the long flower spike of *L. spicata*.—Dry woods, fields, roadsides and waste places; an aggressive, weedy species. Prince Edward Island to Hudson Bay (Hooker, Fl. Bor. Am.) and Saskatchewan (Hooker, l. c.), south to Georgia; west to the Mississippi Valley (Nebraska, acc. to Petersen). Original habitat probably dry, rather open woods; now spreading rapidly to old fields. Rare or absent on the Coastal Plain. Flower beginning about July 1; flower and fruit through the summer. The species is so readily identified that the specimens examined are not cited.

11. *L. CANBYI* Gray, Man. Bot. Ed. 5.: 284. 1867. TYPE LOCALITY: "pine barrens of New Jersey, especially at Quaker Bridge . . . (also South Carolina)." TYPE SPECIMEN: Material collected by W. M. Canby and by C. E. Smith at Quaker Bridge, as well as M. A. Curtis's collections from South Carolina, seen in the Gray Herbarium.—*L. Nuttallii*, in part, of early American authors.—Stem erect, tall and slender, unbranched or with few—several short racemose branches (sometimes much racemosely branched), 30-100 cm. high (ave. 60-70 cm.), smooth or sparsely pubescent and reddish below, becoming smooth and deep green above, leafy. Leaves cauline, 20-40, linear or narrowly lanceolate, $0.05-0.4 \times 0.9-5.0$ cm., often closely appressed, giving the plant a very slender appearance; rather thin, nearly smooth, obscurely callose-denticulate, but sub-entire in outline; the upper often merging gradually into the bracts of the raceme. Roots fibrous;

annual, acc. to Canby, in a letter to Dr. Britton, now in the N. Y. Botanical Garden. Inflorescence a loose terminal raceme 10–30 cm. long, never prominently secund, (10) 15–20 (30)-flowered. Branches, if present, bearing 2–10 flowers each, rarely as many as the central raceme. Pedicels somewhat angular, 7–11 mm. long in fruit, more or less upright, usually distinctly upwardly barbed-ciliate, each with a pair of inconspicuous bracteoles near the base. Flower-bracts linear, about as long as the pedicels, or longer, to 10–20 mm.; smooth or ciliate, callose-denticulate. Calyx in anthesis long-campanulate, rough-puberulent, becoming oval or oblong-oval in fruit, $2.5\text{--}4.0 \times 4.0\text{--}7.0$ mm. Capsule more or less upright, about $\frac{3}{4}$ inferior. Calyx-

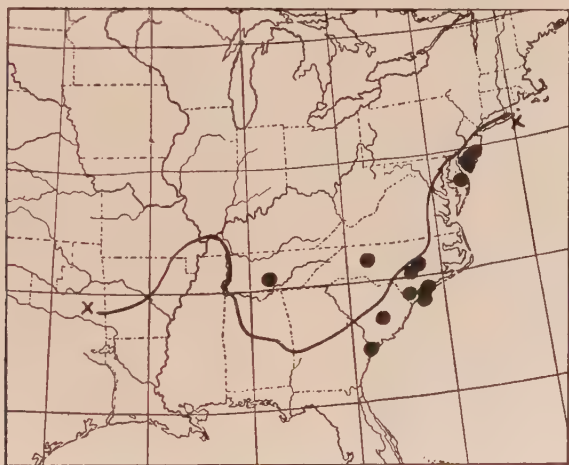


FIG. 21. Range of *LOBELIA CANBYI*.

lobes narrowly lance-linear, acute, 2.5–6.0 mm. long, obscurely callose-denticulate, smooth or somewhat ciliate. Auricles none. Flower 9–14 mm. long, including calyx (ave. 11–12 mm.). Corolla blue, smooth, except for the pubescent base of the lower lip. Corolla-tube entire except for the dorsal fissure; lobes of the lower lip ovate, slightly shorter than the tube; two upper lobes lanceolate, about the same length. Filament-tube about 3.5 mm. long (3–4 mm.), nearly smooth, connate more than half its length above. Anther-tube 1.9–2.1 mm. long, light bluish-gray, the two smaller anthers tufted, the three larger nearly smooth or pubescent on the backs.—Open grassy or sandy swamps, or pineland swamps; Tennessee and Georgia to the Pine Barrens of New Jersey; Appalachian Provinces or Coastal Plain, but in its north-eastern extension confined to the Pine Barrens. Flower August–September (sometimes in July). Representative material seen: TENNESSEE: COFFEE: Tullahoma, *Svenson 4245* (ANS).

GEORGIA: CHATHAM: "Savanna, Aug. 17, 1908" (NC). SOUTH CAROLINA: ORANGEBURG: Eutawville, *Eggleston* 5000 (CM, M, NB, US). NORTH CAROLINA: BRUNSWICK: Southport, *Oosting* 33705 (Duke). COLUMBUS: Whiteville, *Schallert* (Duke); HARNETT: Erwin, *Oosting* 33613a (Duke). IREDELL: Statesville, *Hyams* (M). JOHNSTON: Clayton, *Blomquist* 5026 (Duke). NEW HANOVER: Wilmington, *McCarthy*, ann. 1885 (US). PENDER: Burgaw, *Hyams*, Aug. 1879 (US). DELAWARE: SUSSEX: Ellendale, *Canby* (ANS, NB, US). NEW JERSEY: ATLANTIC: Mays Landing, *Pennell* 8113 (ANS). BURLINGTON: Speedwell, *Stone* 7440 (ANS). CAMDEN: Cedar Brook, *MacElwcc*, Aug. 1893 (ANS). CAPE MAY: Belle Plain, *Stone* 3484 (ANS). OCEAN: Lakehurst, *Long*, Aug. 1908 (ANS).

12. *L. BOYKINII* Torrey & Gray, A.D.C. Prodr. Syst. Veg. VII:

374. 1839. TYPE LO-

CALITY: "in paludibus Georgiae (Boykin) et Floridae (Chapman)."

TYPE SPECIMEN: authentic material, collected by Boykin, in the Torrey herbarium in the New York Botanical Garden. Aquatic, the lower stem immersed. Stem erect, slender, simple or with spreading racemose branches above, smooth, green, fistulose, 50-85 cm. high. Leaves cauline, filiform, smooth, 0.52-2.5 cm. long, few-50 or more, often deciduous,

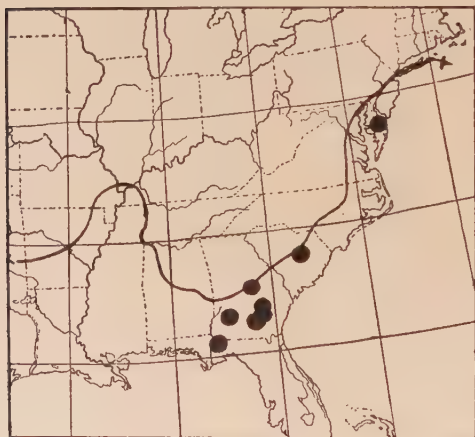


FIG. 22. Range of *LOBELIA BOYKINII*.

entire or obscurely callose-denticulate, the upper merging gradually into the bracts of the inflorescence. Spreading by thick creeping rootstocks. Inflorescence a lax terminal raceme, more or less secund, 7-20 cm. long, bearing 10-25 loosely spreading flowers upon slender smooth pedicels 6-17 mm. long (ave. 10-11 mm.). Bracteoles of pedicel none. Flower-bracts smooth, filiform, much shorter than the pedicels, 2-8 mm. long. Calyx in anthesis very small, round, or appearing flattish because of the spreading calyx-lobes; smooth, becoming hemispheric in fruit, about 3.0 mm. in diameter. Capsule about half inferior, somewhat longer than broad. Calyx-lobes spreading, filiform, 3.0-4.5 mm. long, entire, smooth. Auricles none. Flower 10-13 mm. long, including calyx. Corolla blue, with a white eye, smooth, or ciliate inside, the lower lip smooth or ciliate. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip oblong, short-acute, shorter than the

tube; two upper lobes long-linear, nearly as long as the tube or shorter, erect. Filament-tube 3.5–5.0 mm. long, smooth, connate above about $\frac{2}{3}$ of its length; deflexed. Anther-tube 1.5–1.8 mm. long, bluish-gray, the two smaller anthers sparsely white-tufted at the tips, the three larger pubescent on the backs.—Pineland swamps or cypress ponds, often partially immersed; northern Florida, Georgia, South Carolina, southern Delaware; Coastal Plain. Flower May 1–June 15. Representative material seen: FLORIDA: GADSDEN: Quincy, *Chapman* (NB). GEORGIA: BALDWIN: Milledgeville, *Boykin* (ANS, NB). BERRIEN: Alapaha, *Curtiss 6819* (Del, M, NB). COFFEE: Douglas, *Harper 2199* (NB, US). LEE: Leesburg, *Earle* (Tracy 9118) (NB). TELFAIR: Lumber City, *Biltmore herb. 4167a* (M, US). SOUTH CAROLINA: SUMTER: Cane Savanna, *Stone 420* (ANS). DELAWARE: SUSSEX: Ellendale, *Long and Bartram 1636* (ANS).

13. *L. APPENDICULATA* A. DeCandolle, Prodr. Syst. Veg. VII: 376. 1839. TYPE LOCALITY: "Texas." TYPE SPECIMEN: collected by Drummond; seen by DeCandolle in Bentham's herbarium. Specimens collected by Drummond in Texas, now in the Gray Herbarium, are from Hooker, and are probably authentic.—In appearance and vegetative characters not to be distinguished from *L. Gattingeri* Gray except for the larger size (25–90 cm. high; ave. about 50 cm.); more numerous and larger leaves (4–15 in number, ave. 8–9); size 1–3 × 2–7 cm. Inflorescence a terminal raceme, usually distinctly secund, about 20–30 cm. long, bearing 15–70 (ave. about 30) flowers, upon short curved pedicels (4–11 mm. long in fruit), which are rough-puberulent, each with a pair of inconspicuous bracteoles near the base. Flower-bracts ciliate or nearly smooth, callose-denticulate, linear or narrowly lanceolate, 4–10 (18) mm. long. Calyx in anthesis short-campanulate or flatter, nearly smooth or puberulent, becoming long-campanulate in fruit, with a smooth inflated appearance, 4–6 mm. in diameter. Capsule $\frac{2}{3}$ – $\frac{3}{4}$ or more inferior, horizontal or somewhat pendent at maturity. Calyx-lobes narrowly lance-linear, 4–8 mm. long (ave. about 5.0 mm.), densely bristly-ciliate (sometimes only near the tip); auricles conspicuous (rarely small or lacking), lanceolate-acute or broad-foliaceous, 1–3 mm. long, often white-scarious tipped; often connate; usually bristly-ciliate on the margins. Flower 10–15 mm. long (ave. 12 mm.), including calyx. Corolla light violet-blue or lilac, smooth outside, pubescent inside at the base of the lower lip. Corolla-tube entire, except for the dorsal fissure; lobes of the lower lip broad-ovate, about as long as the tube; two upper lobes shorter, lanceolate. Filament-tube 3–4 mm. long, pubescent below, connate about half its length above, somewhat deflexed. Anther-tube about 2.0 mm. long, bluish-gray, the two smaller anthers tufted at the tips, the three larger pubescent on the backs.

This plant cannot surely be separated, except by geographical range, from *L. Gattingeri* Gray. Apparent differences disappear when various series of measurements are averaged; *L. appendiculata* is a

more widely distributed plant, and consequently has a greater chance to produce extremes, which makes it seem larger on the whole. The ciliation of the calyx in *L. appendiculata* is very variable, as is the length of the auricles, and plants are found which are almost identical with *L. Gattingeri*. However, due to the very restricted range of the latter, and the fact that relatively few intermediate plants have been seen, it seems best for the present to maintain both as good species.

Usually in low sandy soils; prairies, open woods or pinelands, sometimes in dry situations; southeastern Texas to central Alabama, north to Oklahoma, northwestern Arkansas and eastern Kansas; doubtfully Illinois and Missouri. Flower April–June; earlier in the southern part of its range than in the northern. Representative material seen:

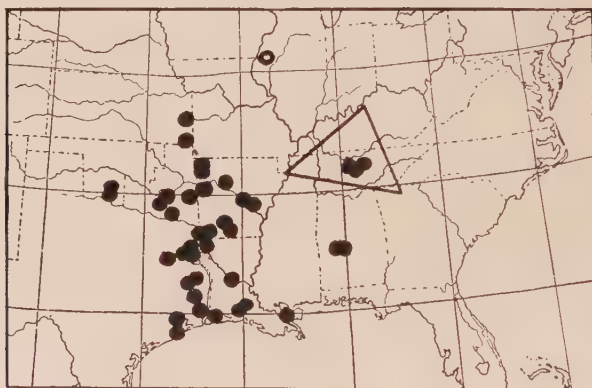


FIG. 23. Range of *LOBELIA APPENDICULATA* and (insert) of *L. GATTINGERI*.

ALABAMA: DALLAS: Marion Jct., *Mohr*, May 1893 (ANS). PERRY: Uniontown, *Mohr*, Jun. 1890 (Mo). LOUISIANA: ACADIA: Crowley, *Pennell 10203* (UP). CADDO: Rhodessa, *Palmer 27157* (Mo). CALCASIEU: Perkins, *Pennell 10214* (ANS); "Calcasieux," *Langlois*, Apr. 1884 (NYS). ORLEANS: New Orleans, *Dr. Ingalls* (NB). RAPIDES: Pineville, *Palmer 7585* (Mo, NB); Alexandria, *Ball 518* (G, Mo, NB, US). ST. LANDRY: Opelousas, *Langlois*, Apr. 1880 (M); May 1885 (UP). TEXAS: *Drummond* (G, NB); ANGELINA: Lufkin, *Biltmore herb. 8216b* (US). BOWIE: *Eggert*, Jun. 1898 (NB). CASS: Hughes Springs, *Biltmore herb. 8216a, 8216d* (US). GALVESTON: Kemah, *Fisher 378* (US). HARDIN: Fletcher, *Palmer 9574* (Mo). HARRIS: Houston, *Lindheimer*, Apr. 1842 (Mo); *Small 11812* (NB). HARRISON: Marshall, *Palmer 7920A* (Mo). SAN AUGUSTINE: San Augustine, *Palmer 9517* (Mo). TYLER: Rockland, *Neally 46* (Del, US). UPSHUR: Big Sandy, *Reverchon 2056* (Mo). VAN ZANDT: Silver Lake, *Reverchon 2085* (Mo). OKLAHOMA: ATOKA: Limestone Gap, *Butler*, May 1877 (ANS, Mo, US); Atoka, *Sheldon 57* (CU). CADDO:

(probably) "Fort Cobb to Fort Arbuckle," *Palmer*, ann. 1868 (NB, US). CHOCTAW: (probably) "Fort Towson, Ark.," *Dr. Edwards* (G). COMANCHE: Cache, *Stevens* 1316 (G, M); Fort Sill, *Mrs. Clemens* 11803 (Mo, R). LEFLORE: Page, *Blakley* 1409 (G, M, Mo, US). PITTSBURG: McAlester, *Pennell* 10601 (UP). ARKANSAS: BENTON: *Plank*, ann. 1899 (CM, NB). MILLER: Texarkana, *Eggert*, Jun. 1898 (Mo). NEVADA: Prescott, *Hollister* 20 (US). OUACHITA: Camden, *Fendler*, Jun. 1850 (G). POPE: Russellville, *Pennell* 10623 (UP). PRAIRIE: Hazen, *Palmer* 25054 (Mo). PULASKI: Little Rock, *Engelmann* 493 (Mo). SEBASTIAN: Fort Smith, *Bigelow*, ann. 1853-4 (US). WASHINGTON: Fayetteville, *Palmer* 8186 (Mo, NB). KANSAS: CHEROKEE: Melrose, *Rydberg and Imler* 242 (NB). MIAMI: Paola, *Oyster*, Jy. 1883 (US); this specimen is on a mixed sheet: the locality may be doubtful. MISSOURI: JASPER: Asbury, *Palmer* 34664 (ANS); this specimen is hardly typical; the characters are close to those of *L. spicata*. ILLINOIS: HANCOCK: Augusta, *S. B. Mead*, Jun. 1859 (Short herb., ANS); this is a mixed sheet; two plants are surely *L. appendiculata*, while the third is close to *L. spicata* var. *hirtella*.

(To be continued)

DATES OF PUBLICATION OF RYDBERG'S FLORA OF THE ROCKY MOUNTAINS AND ADJACENT PLAINS

M. L. FERNALD

IN a recent reorganization of the letter-file at the Gray Herbarium many letters and memoranda of great historic and bibliographic importance have come to light. Some of these concern the dates of issue of Rydberg's Flora. The 1st edition bears on the title-page the date 1917 and the Preface bears the date November, 1917. A copy, subscribed for in advance, was received at the Gray Herbarium on March 5, 1918. Consequently, the communications from Rydberg to the late Mary A. Day regarding the date of issue are significant. Miss Day, editing the Gray Herbarium Card Index, had perpetual difficulty in establishing exact dates of publication. Rydberg's two communications are sufficient indication of this. The first, a card postmarked February 22, 1918 at 7 p. m., follows:

Dear Miss Day:

I have received your two letters and have entered the subscription for the Flora. I have received only 23 copies which were brought here by the manager of the printing house as baggage. I received a notice a month ago that the other books were shipped but received a notice a few days later that there was an embargo on local freight except food. God knows when they will come. I shall send you a copy as soon as I can.

Yours very truly,
P. A. RYDBERG.

This was followed by a longer letter:

New York, March 7, 1918.

My Dear Miss Day:

I have received your letter asking for the exact date of publication of my *Flora of the Rocky Mountains*. The date that I claim as the date of publication is December 31, 1917. I was promised by the bindery to get some bound copies with me to the meeting of the A. A. A. S. at Pittsburg. I called at the bindery in Philadelphia on the morning of December 27th. Some copies were practically bound except that the covers had not been attached. They promised to make them ready the same day. I brought a copy in paper cover to the Pittsburgh meeting, and got orders for about 20 copies.

Dr. Britton received a bound copy on December 31, and I know at least one other person that received a copy on the same day. As I was away a week the rest were not delivered until the first part of January. Then the government put an embargo on local freight, and the bindery could not send the rest of the books. I ordered them to send 50 or 100 copies by express but they did not do so. Then the books were shipped to Philadelphia on February 1, but I did not get them to my place in New York before a month later. The 23 copies that were delivered in December and the early part of January were brought to New York as baggage by the manager of the printing concern.

As some of the books at least were bound on December 31, and at least 2 copies were received by the customers on that date, I think that I have the right to claim that date as the date of publication. Several more had already been sold although it had been impossible to deliver them on that date. . . .

Sincerely yours,
P. A. RYDBERG.

Article 36 of the International Rules reads:

Art. 36. Publication is effected, under these Rules, by sale to the general public or to botanical institutions, of printed matter or indelible autographs, or by distribution of these to specified representative botanical institutions.

No other kind of publication is accepted as effective: communication of new names at a public meeting, or the placing of names in collections or gardens open to the public, does not constitute effective publication.

Miss Day, anxious to please, entered 1917 on the cards, but the requirements of the International Rules regarding effective publication were not actually met until early in 1918. When rival names published late in 1917 appear the date of *effective* publication of the first edition of Rydberg's *Flora* will become highly important.

Now as to the 2d edition. The date on the title-page is 1922, but copies were not available until 1923. The following letter makes this clear.

New York, February 21, 1923

Dear Miss Day:

A few days ago I sent a copy of the second edition of my "*Flora*" to you, and enclose herewith the bill for the same. As to the date of publica-

tion of the book, I am rather in doubt. The book was ready for delivery in the beginning of December, but I received a notice from the binder that they had sent the books to the station in Lancaster on December 6th. A week or so afterwards I received a notice that the Pennsylvania Railroad had put an embargo on freight and that printers had removed the boxes to the Lehigh Valley Railroad. At the time I already had orders for several copies, that, of course, could not be delivered. At the Association meeting in Cambridge in December, I met Mr. Urban and he stated that the Lehigh Valley Railroad had accepted the freight but had held up the shipment just as the Pennsylvania Railroad. I received another letter dated January 3d, enclosing the shipping bill, but did not receive the books before the 21st of January, when the first customer received a copy. Now, the question is, what is the date of publication? The books were ready for shipment in December, but on account of the embargo on freight in order to favor coal shipping, I was incapable of delivering any books until late in January. The book bears on the title-page 1922, and if the date of actual publication is set to the 21st of January, the title page is a liar! You can do just as you please.

Very truly yours,
P. A. RYDBERG.

Without repeating Rydberg's pointed commendation of the title-page of his 2d edition to the Ananias Club, it is clear that one can not do just as he pleases. The specific statement that he "did not receive the books before the 21st of January [1923], when the first customer received a copy" sufficiently answers Rydberg's not very logical question as to "what is the date of publication?". Certainly any author of a competing name effectively published prior to January 21, 1923, has the right-of-way. Rydberg was truly unfortunate in encountering, first, war-conditions and, second, a coal strike. Should competition of names arise, it will be important to have the above letters from him on record.

EUPHORBIA PILULIFERA IN MICHIGAN

OLIVER A. FARWELL

Tons of this plant are annually imported from India for the purpose of manufacturing it into medicine. I have found a plant on waste grounds at Detroit that is this species. Undoubtedly seed has fallen from the bales as they were unloaded from the cars or while on their way to the factory. The plant imported is pubescent with conspicuous yellow hair. In the Detroit plant, the bright yellow of the pubescence is in the main conspicuous by its absence. It was first observed and collected at Detroit, September 5, 1930, no. 8756. It

spread somewhat the two following years but 1933 seemed to be a poor year for it. I left Detroit that year and cannot say if it has maintained its foothold or not. The imported plant is large and much branched. The plant, as it is found in Detroit, is small and simple with mainly a colorless pubescence, due probably to the unsatisfactory location and poor soil, probably not of the proper character to produce vigorous plants.

There seems to be considerable difference of opinion as to what name this species should bear. N. E. Brown in the *Flora of Tropical Africa*, vi.¹ 497 (1911) adopts *E. hirta* L. on the grounds that the herbarium specimen of Linnaeus labeled *E. pilulifera* was the type of the Linnean description of *E. pilulifera* and that the herbarium specimen is *E. parviflora* L., one of the forms of the polymorphous *E. hypericifolia* L.; hence, *E. hirta* L. is the proper name for it since *E. pilulifera* becomes a synonym of *E. hypericifolia* L.

Thellung in Ascherson & Graebner's *Syn. Mitteleurop. Fl.* vii. 424, 425 (1916) declines to accept the argument of N. E. Brown on the ground that Linnaeus had no description of his own in the *Sp. Pl.* i. 454 (1753) of *E. pilulifera*, hence the herbarium specimen could not be the type. He accepts the citation of Burman *Thes. Zeyl.* 224, t. 105, fig. 1 as the type of *E. pilulifera* L. This makes it synonymous with *E. hirta* L. published on the same page; as Grisebach first united these two species under the name of *E. pilulifera* and was followed by Boissier in *DC. Prodr.*, *E. pilulifera* L. is the proper binomial to use. Thellung agrees with N. E. Brown only in calling the Linnean herbarium specimen *E. parviflora* L. The premise of N. E. Brown is wrong from the start, for he is forcing upon an ancient botanist a "type" for his species when that botanist had no type and knew not the meaning of the word as it is expounded by botanists of the current times. One of the citations must be the type of the species; long-established custom has made it the Burman citation which makes it synonymous with *E. hirta* L.; and as shown by Thellung *E. pilulifera* is the proper name to use. *E. hypericifolia*, *E. hirta* and *E. pilulifera* were published by Linnaeus on the same page and in the order just given.

LAKE LINDEN, Michigan.

Volume 38, no. 452, including pages 273-300, was issued 7 August, 1936.

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